

## HORTICULTURAL ABSTRACTS.

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**Abstracts.** Signed abstracts are by Dr. C. West of the Ditton Laboratory, East Malling, and by Mr. T. N. Hoblyn, Mr. W. S. Rogers, Dr. H. Shaw and Dr. H. Wormald of the East Malling Research Station.

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## Horticultural Abstracts

Vol. VIII

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## MISCELLANEOUS.

*Growth promoting substances.\**

616. SCHNEIDER, C. L. 577.15.04

**The interdependence of auxin and sugar for growth.***Amer. J. Bot.*, 1938, 25 : 258-69, bibl. 22.

It was found that under certain conditions (with *Avena* seedlings) the effects of auxin and sugar on growth are interdependent in such a manner that, for sub-optimal concentrations, an increase in concentration of either one gives an increase in growth rate. The magnitude of this increase is formulated as proportional to the product of the logarithms of the concentrations. By postulating an upper limit to the growth rate, set by the capacity of the growth system, it is consistent with present knowledge to apply this formula generally. [From author's summary.]

617. SKOOG, F. 577.15.04

**Absorption and translocation of auxin.***Amer. J. Bot.*, 1938, 25 : 361-72, bibl. 29.

From experiments described the conclusion is drawn that auxin applied in external solutions may influence growth of aerial portions of plants in 2 ways. (1) High concentrations may be absorbed and act directly on these tissues. (2) Very low concentrations (about 0.00005 mg. per litre) are not absorbed into the aerial portions but may act indirectly through an influence on the roots. [From author's summary.]

618. THIMANN, K. V., AND SCHNEIDER, C. L. 577.15.04

**The role of salts, hydrogen-ion concentration and agar in the response of the *Avena* coleoptile to auxins.***Amer. J. Bot.*, 1938, 25 : 270-80, bibl. 24.

The experiments reported in this paper deal with (1) the technique of getting the auxin into the agar for use in the curvature test with the decapitated *Avena* coleoptile and the influence of neutral salts thereon ; (2) the role of pH, i.e. the relative activity of the auxin acid and its K or Na salt, both for curvature and for straight growth ; (3) the effect of neutral salts on straight growth.

619. SCHEER, B. A. 577.15.04

**Straight growth of the *Avena* coleoptile in relation to different concentrations of certain acids and their potassium salts.***Amer. J. Bot.*, 1937, 24 : 559-65, bibl. 6.

A straight growth method (total increase in length of decapitated *Avena* coleoptiles) is described for measuring the effectiveness of growth-stimulating substances. The optimum concentrations

\* See also 652, 743, 856.



of the compounds tested were found to be much higher when tested by straight growth than when tested by unilateral growth (*Avena* curvature method). The concentration range over which growth was promoted (up to the optimum) consequently was much wider when tested by the straight growth method. The decrease in growth promotion at successively higher concentrations than that for optimum growth is interpreted as an indication of increasing toxicity of the substances being tested. This cannot be demonstrated by the *Avena* curvature method for reasons enumerated in the text. The distribution of the growth substances in the coleoptile could be determined by the recovery method, nevertheless this method failed to detect growth stimulating substances in the lower regions of the coleoptile, although their longitudinal distribution could readily be shown by the growth increases brought about by them.

620. STEWART, W. S. 577.15.04  
**Extensibility of cell wall material in indole-3-acetic acid.**

*Amer. J. Bot.*, 1938, 25 : 325-8, bibl. 7.

Artificial silk was found to have an increased extensibility in certain organic acids known not to be growth substances as well as in 0.2% indole acetic acid. Onion roots were found to have an increased extensibility in 0.2% indole acetic acid and 0.2% acetic acid. [From author's summary.]

621. AVERY, G. S. JR., BURKHOLDER, P. R., AND CREIGHTON, H. B. 577.15.04  
**Growth hormone in terminal shoots of *Nicotiana* in relation to light.**

*Amer. J. Bot.*, 1937, 24 : 666-73, bibl. 12.

Growth hormone disappeared after 6-10 days from the shoot tips of mature Turkish tobacco plants kept in darkness. In the shoot tips of smaller plants it could not be detected after 2½ days. The hormone reappeared within 18 hours when the plants were illuminated, the recovery being proportionate to the light intensity. Under a given intensity (1,000 watt Mazda lamp at 15 inches) a uniform high level of hormone concentration was established after 69 hours. In plants under normal night and day conditions a reduced CO<sub>2</sub> supply also reduced the hormone content. Under reduced CO<sub>2</sub> conditions and continuous light growth hormone content was proportionately greater in plants subjected to the higher intensities. Studies with monochromatic light were not conclusive. Whether light has an effect on the production of growth hormones other than indirectly through synthesis of carbohydrates is still undecided.

622. GREENFIELD, S. S. 577.15.04 : 635.936.832  
**Responses of stock seedlings to heteroauxin applied to the soil.**

*Amer. J. Bot.*, 1937, 24 : 494-9, bibl. 11.

Groups of stock seedlings (*Matthiola incana*) were treated with various concentrations of heteroauxin by the application of aqueous solutions to the soil. The lowest concentrations produced no observable effect. The second range accelerated the growth rate. The next higher range did not affect the linear growth rate but produced bud inhibition, and thickening and whitening of the stems, which also appeared in the last, toxic range. In the latter inhibition of growth and epinastic curling of the cotyledons also occurred. A hypothesis is offered to explain the ability of heteroauxin to stimulate the growth of certain plants whereas it fails to stimulate others. [Author's summary.]

623. ALBAUM, H. G. 577.15.04  
**Inhibitions due to growth hormones in fern prothallia and sporophytes.**

*Amer. J. Bot.*, 1938, 25 : 124-33, bibl. 34.

The appearance of adventitious outgrowths in fern prothallia under a variety of abnormal environmental conditions is discussed in terms of growth hormone concept. [From author's summary.]

624. AVERY, G. S. JR., BURKHOLDER, P. R., AND CREIGHTON, H. B. 577.15.04  
**Nutrient deficiencies and growth hormone concentration in *Helianthus* and *Nicotiana*.**

*Amer. J. Bot.*, 1937, 24 : 553-7, bibl. 3.

Except for nitrogen it was not possible to determine the relationship to hormone production of the elements nitrogen, sulphur, phosphorus, magnesium, potassium and calcium because of the irreversible weakening of the plants (*Helianthus* and *Nicotiana*) caused by extreme deficiencies of any of the several elements except nitrogen. Growth hormone concentration varies with growth vigour; both may be controlled by varying the nitrogen supply. No nitrogen, no growth, and no growth hormone. The synthesis of new protoplasm at growing points of plants is accompanied by growth hormone production. Whether the relationship to growth is one of cause or effect is still uncertain, but the evidence is clear that growth hormone is produced in adult plants in regions such as shoot tips where there is continued meristematic activity.

625. ROBBINS, W. J., AND JACKSON, J. R. 577.15.04  
**Effect of 3-indole acetic acid on cell walls of stem and root.**

*Amer. J. Bot.*, 1937, 24 : 83-8, bibl. 9.

Stem wall material such as cotton thread and hemp cord stretches more and such as paper strips, dried strips of potato tuber, fresh twigs of elm and *Ambrosia* bends more after treatment with 0.2% indole acetic acid in lanolin than with lanolin alone, but the reverse is the case as regards the bending with dried roots of corn, willow and fresh tap roots of *Ambrosia* and of *Chenopodium*. These results may explain why the growth hormone increases the growth of stem but inhibits that of roots. It may increase the extensibility of stem walls and decrease that of root walls. The conclusion follows that the chemical or physical condition of stem walls differs from that of root walls.

626. MACHT, D. I., AND GRUMBEIN, M. L. 577.15.04  
**Influence of indole acetic, indole butyric and naphthalene acetic acids on roots of *Lupinus albus* seedlings.**

*Amer. J. Bot.*, 1937, 24 : 457-60, bibl. 23.

The growth of roots of *Lupinus albus* seedlings was definitely stimulated after a brief exposure to any of the 3 chemicals mentioned in the title. Longer exposures or exposures of higher concentrations invariably produced a toxic or inhibitory effect on root growth of the plants studied.

627. DELISLE, A. L. 577.15.04  
**The influence of auxin on secondary branching in two species of *Aster*.**

*Amer. J. Bot.*, 1937, 24 : 159-67, bibl. 38.

The branching habit of 2 species of aster, *Aster Novae-angliae* and *A. multiflorus* differs considerably, the former being practically unbranched and the latter branched and bushy. Data are produced to show that the branching habit in these species is largely correlated with the amount of auxin produced in the terminal bud and to a lesser extent with that produced in the young leaves.

628. WALKER, R. I. 577.15.04  
**The effect of colchicine on microspore mother cells and microspores of *Tradescantia paludosa*.**

*Amer. J. Bot.*, 1938, 25 : 280-5, bibl. 22.

Flowering stems of *Tradescantia* were placed in aqueous solutions of colchicine of various strengths and the effects on the microspore mother cells and microspores are described.



629. WÓYCICKI, S., AND JASTRZĘBSKA, W. 577.15.04 : 631.535  
Przebieg ukorzenia się sadzonek pod wpływem substancji korzeni-  
twórczych. (**Root stimulants in propagation of cuttings.**) [German sum-  
mary 1½ pp.]  
*Ann. Sci. hort.*, Warsaw, 1937, 4 : 177-95, bibl. 20.

Rooting trials were made at the Institute for Ornamentals, Agricultural College, Warsaw, with cuttings of *Pelargonium zonale* var. Meteor, *Ampelopsis quinquefolia*, *A. quinquefolia* var. Engelmännii, *Hedera Helix*, *Euonymus radicans*, *Syringa vulgaris*, *Ginkgo biloba* and the rose Clotilde Soupert. Root stimulants used were indole-3-acetic acid, phenylacetic acid and phenyl-propionic acid. These acids were applied as aqueous solutions at a strength of 0.01-0.005%. All results are tabulated. The effect of phenylacetic acid and phenyl-propionic acid was less marked than that of indole-3-acetic acid treatment. No definite results regarding the strength of the solutions and the time of exposure were obtained. Data indicate, however, that for rooting of *Syringa* and *Ampelopsis* cuttings strong solutions are disadvantageous and particularly so, if the cuttings are subject to prolonged treatments. Phenyl-propionic acid had an ill-effect on the rooting of *Hedera Helix* and *Euonymus radicans* cuttings, especially when exposures were long. *Ginkgo biloba* cuttings, on the other hand, rooted more quickly and developed healthier roots when they were treated with more concentrated solutions and for prolonged periods.

630. MÜLLER-STOLL, W. R. 577.15.04 : 634.8-1.541  
Versuche über die Verwendbarkeit der  $\beta$ -Indolylessigsäure als verwachsungs-  
förderndes Mittel in der Rebenveredlung. ( **$\beta$ -Indolylacetic acid as an aid to  
callusing of stock and seion in vines.**)  
*Angew. Bot.*, 1938, 20 : 218-38, bibl. 8.

A report of the trials with synthetic heteroauxin, carried out for two years at the Freiburg i. Br. State Viticultural Institute. No definite results were produced with Laibach's paste. Of the various concentrations of aqueous solutions 0.05%  $\beta$ -indolylacetic acid gave the best results in the short-time, concentrated-solutions trials. No data are as yet available on the experiments in which dilute solutions of  $\beta$ -indolylacetic acid were applied for prolonged periods.

631. MARQUES DE ALMEIDA, C. R. 577.15.04 : 634.31-1.535  
Nota prévia sobre o emprêgo do ácido  $\beta$ -indolyl acético no enraizamento das  
estacas da laranjeira azêda. (**Preliminary notes on the use of  $\beta$ -indolylacetic  
acid in rooting cuttings of sour orange.**)

Reprinted from *Bol. Soc. broteriana*, 1938, 13 (2nd ser.) : 117-21, bibl. 5.

The work of previous investigators on the growth-producing substances either contained in the plant or of a synthetic character is very briefly mentioned, starting with Sachs, 1882, who then postulated the existence in the plant of substances capable of stimulating growth. Experiment is mainly concentrated on those plants which are difficult to root by ordinary means, for instance certain woody rootstocks which resist vegetative propagation. In this group can be classed the sour orange. In the experiments made by the author  $\beta$ -indolylacetic acid, which is not easily soluble in water, was dissolved in drops of 95% alcohol to which was added the quantity of water necessary to attain the desired dilution. The addition of such a small quantity of alcohol has no effect on the properties of the solution. The concentration of the solution was 1/10,000, and, to avoid possible changes if kept, the solution was made up as required. The orange cuttings were stood in it for 24 hours then washed in distilled water and planted, bottom heat being given to encourage rooting. The rooting medium was a mixture of coarse and fine sand and the humidity of the atmosphere was maintained at a high level. The experiments began on 1 November, callusing had started by 6 December, and the first roots had appeared by 28 December, but owing to the time of year results were uneven. They are, however, considered promising particularly as the cuttings used were woody and leafless, a state which considerably

diminished their chances. Experiments are continuing with half-ripened leafy cuttings, since this type is known to root more easily. An average tree should be able to furnish 1,000 cuttings per annum. The leaves are left on entire on this type of cutting except for the two at the base.

632. WEAVER, J. G. 577.15.04 : 631.535 : 577.15.04

**Use of organic acid in rooting cuttings.**

*Ext. Circ. N.C. agric. Exp. Sta.* **221**, 1938, pp. 12.

In 1935 the effect was studied of various treatments with a root growth substance (indolebutyric acid) on summer cuttings of various local plants at the North Carolina State College. Root development after 3 months was best with a six-hour soaking period, in either 2 or 4 mg. per 100 c.c. Stronger solutions and longer soaking periods caused injury to the base of the cuttings. The base of the injured cuttings appeared dark and the bark along this portion separated from the stem as if the cambium layer had been injured.

633. LENIN ACADEMY OF AGRICULTURAL SCIENCES, MOSCOW. 577.15.04

**Effect of animal hormones on the development of vegetables.** [Russian.]

*Trans. Lenin Academy of Agricultural Sciences*, 1936, No. 6 (ser. 1), pp. 37, bibl. 11, roubles 1-0.

In the first of the three articles, the effect is discussed of hormones of animal origin (folliculin and prolactin) on growth and development of the cucumber, Russian black bean, kidney-bean, turnip, radish, pea, tomato, onion and garlic. In the second, folliculin and prolactin as affecting growth and development of potatoes are dealt with, and in the last article the effect of these hormones on the development of chicory and Jerusalem artichoke is described. Further articles by various investigators discuss the results obtained.

634. WATKINS, J. V. 577.15.04 : 635.952.2

**Experiments with Hormodin on tropical and semi-tropical plants.**

*Florists' Exchange*, July 17, 1937, pp. 3.

WATKINS, J. V.

**Experiments with Hormodin on semi-tropical plants.**

*Univ. Fla. Publ. Hort.*, 1938 (?), pp. 5.

In these papers experiments are reported in which commercial preparations known as Hormodin A (indolebutyric acid) and Hormodin B (naphthaleneacetic acid) were used for the acceleration of the rooting of various woody cuttings. The results are tabulated and in most cases show a great increase in numbers rooted in comparison with the untreated controls.

635. GUSTAFSON, F. G. 577.15.04 : 581.163

**Further studies of artificial parthenocarp.**

*Amer. J. Bot.*, 1938, **25** : 237-44, bibl. 10.

Of 13 new chemicals tested K-indole acetate, pyrrole- $\alpha$ -carboxylic and pyrrole- $\alpha$ -acetic acids produced parthenocarpic fruits in several different plants. The potassium salt of indole acetic acid is approximately as effective as the acid. [From author's summary.]

The following also is noted :—

636. KEW, ROYAL BOTANIC GARDENS. 577.15.04

**A summary of the discussion concerning the use of chemicals to stimulate the formation of roots on cuttings held at the Royal Botanic Gardens, Kew, on Saturday, November 6th, 1937.**

*Mimeograph*, pp. 13.



## Roots.\*

637. OPPENHEIMER, H. R. 581.144.2

Études sur le développement des racines de quelques plantes méditerranéennes.

(Studies of the root development of some Mediterranean plants.)

Reprinted from *Bull. Silva. medit.*, 1935, X année, pp. 23, bibl. 10.

Simply constructed root observation boxes, sunk in the soil and viewed from a subterranean chamber, at the Hebrew University of Jerusalem, are described. 11 wooden cases 21 cm. × 19 cm., of lengths varying from 50 to 150 cm., with sloping glass plates forming the bottoms, were used to study the rate of tap-root growth of oak and pine seedlings. In another series 12 metal frameworks (made of petrol cans) supporting glass sides at an angle of 35° to the vertical, were used for observations on young oak, vine, *Retama Roetam*, and *Cercis Siliquastrum* roots. In spite of difficulties (including the partial assimilation of some of the trees by donkeys) interesting and suggestive results were obtained. Tap-roots of oaks penetrated vertically 60 to 80 cm. in the 1st year, and 140 cm. in the 2nd, in sandy-clay soil. Greatest growth occurred from April to June. Checking of growth observed in midsummer is attributed to drought. Roots of surrounding trees, which invaded the observation boxes through their drainage holes, demonstrated the powerful action of hydrotropism, and the severe competition met by young plants placed among established trees. W.S.R.

638. WHITE, P. R. 577.15.04 : 581.144.2

Cultivation of excised roots of dicotyledonous plants.

*Amer. J. Bot.*, 1938, 35 : 348-56, bibl. 9.

Attempts made to grow isolated excised roots of 30 species of dicotyledonous plants *in vitro* were successful only with 18. Apparently conditions for success are not general for all species, but there is no reason to suppose that with sufficient study conditions could not be provided to suit excised roots of any dicotyledonous plant.

639. NIKLEWSKI, B., AND WOLNICKA, J. 577.15.04 : 581.144.2

On the morphological phenomena of roots chemotropically excited.

Reprinted from *Bull. Acad. Polon. Sci. Lettr. Cracow*, sér. B. Sci. nat. (I), 1937, pp. 147-57, bibl. 8.

This reprint is a continuation of work already published† in which the hitherto unexplained phenomenon of chemotropism of roots is being investigated. Macro- and microscopical observations are described and the results set out in a number of tables. Apparently the substances that produce chemotropic reactions are introduced into the organism where they inactivate the growth substances on the excited side by precipitation or absorption. The exciting substances used in the experiments were phosphates, humus, methyl-violet, eosine and mercuric chloride.

640. WHITE, P. R. 581.144.2 : 581.13

"Root pressure"—an unappreciated force in sap movement.

*Amer. J. Bot.*, 1938, 25 : 223-7, bibl. 10.

Experiments have shown that excised tomato roots growing *in vitro* secrete sap continuously and rhythmically from their proximal ends. Methods for measuring the force of their secretion have been developed and are described. It is not retarded by opposed pressures of 90 lb. per sq. inch, so that the secretion force therefore probably greatly exceeds this value. A pressure of 90 lb. per sq. inch is sufficient to raise water to a height of 200 ft. Thus root pressure may be a far more important factor in sap movement than has been generally conceded. At present no attempt is made to explain how this force is developed. The paper opens with a brief recapitulation of some of the theories that have been put forward during past years to account for sap movement and shows how formerly the root pressure theory (Hales, 1727) was rejected largely because an adequate technique for recording had not then been developed and because the plants used were moribund.

\* See also 680, 699.

† Niklewski, B. and others. *Biochem. Ztschr.*, 1936, 286 : 110, and 120.

641. KRAMER, P. J. 581.11  
**Root resistance as a cause of the absorption lag.**  
*Amer. J. Bot.*, 1938, **25** : 110-3, bibl. 7.

From experiments made with sunflower plants to determine why absorption lags behind transpiration in plants which have adequate root systems and an abundant supply of water, indications were obtained that the living cells between epidermis and xylem are, from the considerable resistance they offer to the passage of water, responsible for a large part of the absorption lag at normal temperatures. The resistance is greatly increased at low temperatures probably because of the increased viscosity of both protoplasm and water as temperature decreases.

*Physiology.*

642. RAMDAS, L. A., AND MALLIK, A. K. 581.113  
**The exchange of moisture between air layers near the ground and substances like soils, plant leaves, seeds, etc., exposed to the atmosphere.**  
 Reprinted from *Curr. Sci.*, 1938, **6** : 452-4, bibl. 6.

Dry leaves of jowar and samples of wheat, paddy, bajri and jowar seeds were, like soil surfaces, found to exchange moisture with the air layers surrounding them.

643. WALLACE, R. H., AND CLUM, H. H. 581.144.4 : 551.56  
**Leaf temperatures.**  
*Amer. J. Bot.*, 1938, **25** : 83-97, bibl. 21.

The study is a detailed re-examination of the problem of leaf temperatures with more adequate measuring devices than those used by previous workers and with a new technique. From the data obtained it seems that transpiration is necessary at times to prevent leaves or leaf parts normal to the sun (i.e. not edgewise) from being injured. As far as the experiments have gone there appears to be no marked difference in temperature relation between leaves, stems and flowers.

644. PALMQUIST, E. M. 581.13  
**The simultaneous movement of carbohydrates and fluorescein in opposite directions in the phloem.**  
*Amer. J. Bot.*, 1938, **25** : 97-105, bibl. 16.

Experiments are described which lead to the conclusion that carbohydrates and fluorescein can move simultaneously in opposite directions in the same phloem tissue. The compound leaves of kidney bean (*Phaseolus vulgaris*) were used.

645. CURTIS, O. F. 634.11 : 551.56  
**Vapor pressure gradients, water distribution in fruits and so-called infra-red injury.**  
*Amer. J. Bot.*, 1937, **24** : 705-10, bibl. 11.

Experiments are described from which it is shown that the setting up of a steep temperature gradient (5°-10° C.) across an apple will result in a marked distillation of water from the warm to the cool side : the warm side will become withered and will show injury which has previously been thought to be due to direct radiation, a theory which in the course of this investigation is shown to be untenable. From the fact that a steep temperature gradient has little effect on osmotic movement of water and other evidence it is considered that the water movement is restricted to movement in vapour form. It follows that redistribution of water due to temperature differences in massive tissue is likely to be restricted to tissues having connecting intercellular spaces.



646. RAINES, M. A. 578.082

**Wick culture of seedlings with different rates of water flow.**

*Amer. J. Bot.*, 1937, **24** : 185-7, bibl. 4.

An apparatus is described by means of which a plant may be grown with its root system confined to the very thin space between a sheet of wet black blotting paper and a sheet of glass. Culture solution moves easily through the paper at a rate that may be regulated easily. Aeration of the roots is excellent and is thoroughly maintained. The rate of flow can be slow or rapid. Primary roots grew much more rapidly with slow flow than with rapid flow and the reverse is true for stems and leaves.

*Various.*

647. TALBERT, T. J. 631.531/536

**Plant propagation by seedage, cuttage, layerage and separation.**

*Circ. Mo. agric. Exp. Sta.* **191**, 1936, 18 pp.

An illustrated description of the vegetative propagation and sexual reproduction of various types of plants which contains much of value.

648. ANON. 631.521.5

**Rules and recommendations for testing seeds.**

*Circ. U.S. Dep. Agric.*, **480**, 1938, pp. 24.

Methods are described here for determining the viability of seed. Part I contains certain processes and definitions forming the basis of the standard analysis. In Part II the principles involved in the various tests together with suggestions for procedure, based on the past experience of seed analysts, are discussed.

649. ARNON, D. I. 631.811.9

**Microelements in culture solution experiments with higher plants.**

*Amer. J. Bot.*, 1938, **25** : 322-5, bibl. 5.

A marked beneficial response was obtained with lettuce and asparagus when the water cultures in which they were growing were supplemented with minute joint additions of boron, manganese, zinc and copper, and a further significant increase of growth was obtained by the joint addition of molybdenum, vanadium, titanium, tungsten, chromium, nickel and cobalt.

650. LOEW, O. 631.825

Über die Aufnahme des Eisens durch die Wurzeln und über Eisendüngung. Steigerung des Ertrages durch Düngung mit Ferrosulfat im Vergleich zum Manganosulfat. (**Iron fertilizers and the addition of iron through the roots.**)

*Angew. Bot.*, 1938, **3** : 238-40.

The author gives an account of experiments made some years ago on young *Cryptomeria* plants 17-20 cm. high, which were planted out in a sandy loam soil containing organic matter and were then given either monthly doses of 0.5 g. manganous sulphate (1 g. at first watering) from May to November in two successive years or equal amounts of ferrous sulphate, sodium chloride, sodium nitrate or calcium nitrate, the control bed receiving water only. The growth made was then estimated by weight, when it was found that the plants given manganese sulphate had made considerably more growth than the others.

651. MILLER, M. F. 631.459

**Soil conservation in an improved agriculture.**

*Bull. Mo. agric. Exp. Sta.* **362**, 1936, 15 pp.

This bulletin deals with deterioration of soils in the United States, due to erosion, leaching, loss of nutrients through cropping and other causes which are here discussed.

652. MURNEEK, A. E.

612.014.44 : 635.655

**Biochemical studies of photoperiodism in plants.***Res. Bull. Mo. agric. Exp. Sta.* **268**, 1937, pp. 84, bibl. 229.

The study deals primarily with the physiology of photoperiodism in the soybean plant, var. Biloxi. Exposed to a photoperiod conducive to reproduction (7 hour day) two significant effects on development were recognized:—(1) photoperiodic induction of reproduction, occurring during the first 4-14 days and photoperiodic inhibition or reduction of growth in height, most conspicuous soon after induction is completed. The causal mechanisms have not been discovered and the phenomena appear to be independent of each other. During the period of induction a relatively higher nitrogen metabolism and a lower carbohydrate concentration is maintained by the reproductive (7 hour day) plants than by the vegetative (14 hour day) plants. Stems of reproductive plants were higher in all determined forms of nitrogen except nitrates but no specific dynamic functions in the initiation of floral organs can be ascribed to any particular form or group of substances. The action of a specific flower-producing hormone functioning independently of the general nutritional state of the plant is suggested. The 7 hour plants maintained a higher respiration rate than 14 hour plants during photoperiod induction. A similar increase in respiration occurred when the long day plants were moved to a short photoperiod. The growth promoting substances, indoleacetic, indolepropionic and phenylacetic acids have no effect on the initiation of sexual reproduction. In the short day plants photoperiod inhibition retarded growth after 10 days exposure and caused it to cease after the 20th day. The curtailment of growth causes an accumulation of nitrogen and especially carbohydrates in the stems and other structural parts. These groups of organic substances are utilized by the long day plants for vegetative growth and by the short day plants (whose growth is inhibited) for the development of the reproductive parts. The carotene and xanthophyll concentration of the leaves of the soybean plants exposed to a 7 hour day reaches a maximum at the approximate time of flowering and then decreases. Buds, flowers and young fruit tissues have a comparatively high carotene content.

653. WOJCIECHOWSKI, J., AND SKROBIŃSKA, J.

545.371 : 631.811.2

L'influence de la concentration des ions d'hydrogène sur le chimiotropisme produit par les phosphates. (**Influence of H ions on the chemotropism produced by phosphates.**)

Reprinted from *Bull. Acad. Polon. Sci. Lettr. Cracow*, sér. B, Sci. nat. (I), 1937, pp. 191-6, bibl. 7.

The absence of chemotropism in a purely acid or alkaline medium is due to the negative action which is exercised by H-ion concentration on the production of compounds formed by the combination of growth substances with phosphates. The hydrogen ions and hydroxyl ions, on the other hand, are incapable of producing chemotropic curvatures.

654. DENNIS, R. W. G., AND O'BRIEN, D. G.

546.27 : 63

**Boron in agriculture.\***

*Res. Bull. W. Scot. agric. Coll. Plant Husb. Dep.* **5**, 1937, 98 pp., bibl. 10½ pp.

This is a survey of the knowledge now available on the effects of boron in agricultural practice, presented in the form of abstracts of the more important work. The following notes are taken from the author's summary:—The boron content of rocks varies considerably according to their nature. The boron content of soils also varies, but its availability to plants also depends on certain factors, the most important of which are the lime and water contents of the soil. Heart-rot of beet and mangolds is due to lack of available boron and can be prevented by application of 20 lbs. of borax or an equivalent amount of boric acid per acre. Brown-heart of swedes and turnips is also a symptom of boron deficiency and can be controlled in the same way. Boron deficiency in tobacco occurs in certain soils in Sumatra and America. Similar diseases in potato and tomato have not been observed in the field, but there is some evidence that boron may exercise a stimulating effect on the former crop. Internal cork of apples is prevented by boron

\* See also 925.



manuring, which also appears to be essential for normal root development of the strawberry. Cracked stem and heart-rot of celery can be controlled by applications of boron. Boron is essential for normal development of other crop plants such as various leguminosae, cotton, lettuce, citrus, etc., but it is doubtful if boron deficiency in these crops has yet been recorded in the field. The gramineae require relatively less boron than other crops, and it is improbable that any increase in yield would result from application of boron compounds to cereals. The effect of boron on the incidence of fungoid diseases deserves further investigation. Boron is of universal occurrence in living organisms, and flowering plants cannot attain their full development in the absence of traces of that element. The function of boron appears to be bound up with the water relations of the cell and with translocation through the phloem.

655. OVERHOLSER, E. L., OVERLEY, F. L., AND WOOTON, L. B. 634.1/8-2.19 : 546.27

**Boron in horticulture.**

*Sci. Pap. Wash. St. agric. Exp. Sta.*, 1937 (?) 376 : 73-86, bibl. 31.

In connection with boron deficiency studies on other horticultural crops, various boron compounds were injected and applied to the soil of d'Anjou pears suffering from cork spot, black end and hard end. The results of the experiments, which are tabulated, can be summarized as follows :—Cupric borate reduced the percentage of cork spots to one-third. There are indications, however, that the element involved with cork spot is not boron, but possibly copper deficiency. Boron treatments did not improve either hard-end or black-end conditions in d'Anjou pears, with the exception of borate of manganese which was found somewhat helpful in reducing the hard-end condition.

656. RAE, R. 631.312 : 633.912  
**Report on pneumatic-tyred carts and other equipment in use on the University of Reading Farm at Sonning-on-Thames.**

*Rubb. & Agric., special Series Bull. A \**, 1937, pp. 16.

Pneumatic tyres proved very efficient for practically all items of moving transport of any kind on the University farm. It is stated that most farmers who have tried pneumatic tyres and roller bearings are well satisfied and that the only limitation to a more rapid expansion of their adoption is the capital required.

657. HUTCHINSON, H. P. 634.973.623  
**The raising of sets of the cricket bat willow.**

*Annu. Rep. Long Ashton Res. Sta. for 1937*, 1938, pp. 243-9, bibl. 2.

The author describes in detail the old methods of raising sets of the cricket bat willow and the improvements on those methods which experiments at Long Ashton have evolved. The primary object of the Long Ashton method is the production of flawless wood.

658. LEPPAN, H. D. 63  
**The stabilisation of South African farming : a policy for safety.**  
*Publ. Univ. Pretoria Ser. I. Agric.* 45, 1938, pp. 21.

Agricultural economics with special reference to South Africa are here briefly discussed.

659. CYPRUS DEPARTMENT OF AGRICULTURE. 351.823.1  
**Summary of the agricultural legislation in Cyprus.**  
*Bull. Dep. Agric. Cyprus* 2, 1937, pp. 23.

In this bulletin agricultural Laws and Regulations now in force in Cyprus are summed up under the following heads : (1) General agricultural legislation, (2) insect pests and fungus diseases, and (3) veterinary legislation.

\* Published by the British Rubber Publicity Ass., 19 Fenchurch Street, London.

660. IMPERIAL INSTITUTE, LOND.

061 : 631.57

**List of advisory councils and consultative committees.***Suppl. Bull. imp. Inst.*, 36, 1938, No. 1, pp. 15.

A list of the various advisory councils and consultative committees and their members serving the Imperial Institute.

661. MILLER, J. C., AND KIMBROUGH, W. D.

634/5

**Eight-year summary of horticultural investigations.***Bull. La agric. Exp. Sta.* 287, 1937, pp. 29.

In this tabulated and illustrated bulletin are given the results of the cultural, breeding and physiological work obtained by the Horticulture Department of the Louisiana Agricultural Experiment Station from 1929 to 1936. The crops worked with are discussed briefly in alphabetical order. Fuller information may be had from the other publications of the Experiment Station, a list of which is given.

662. PARKS, H. B.

581.9 : 633/5

**Valuable plants native to Texas.***Bull. Tex. agric. Exp. Sta.* 551, 1937, pp. 173.

This is a descriptive catalogue of over 3,000 of the 5,000 plant species native to or naturalized in Texas. Certain very common native plants and those known to be easily obtainable from nurseries or seedsmen have been omitted through lack of space, and, for the rest, only plants personally observed by the author and/or studied experimentally have been included. Purely botanical descriptions are not given but full notes on the habits, general appearance, uses and other information of interest are provided.

663. NATIVIDADE, J. V.

634.985.5

*Técnica cultural dos sobreirais. II. Descorticamento.* (Cork oak growing.**II. Stripping the cork.)**

Ministério do comércio e indústria, Junta nacional da cortiça, Portugal, 1938, pp. 71.

The author discusses the physiological effects of stripping cork from the cork oak and the technique which is to be recommended.

**TREE FRUITS, DECIDUOUS.***General.*

664. KEMMER, E.

581.5 : 634.1/7

*Ökologische Untersuchungen auf dem Gebiete des Obstbaues.* (Ecological investigations in fruit growing.)*Forschungsdienst*, Sonderheft 8, 1938, pp. 362-6, bibl. 5.

Until recently but little attention has been paid in fruit research in Germany to the study of local climatic conditions. But in the last 2 years 14 ecological stations have been established, covering all the fruit producing districts in Germany. Each station is supplied with maximum and minimum thermometers, rain gauges and all the usual meteorological recording instruments. At every station 4 Berlepsch and 4 Boskoop trees are grown on Malling Stock No. II for the purpose of ecological study. Owing to the small area of the stations no more trees could be accommodated.



665. HOBLYN, T. N. 634.11

La culture des pommes en Angleterre. (**Apple growing in England.**)

*Bull. Agric. Montréal*, 1938, 23 : 20 : 9 and 24, and 23 : 25 : 6, 25 and 26.

The author gives a brief account of apple growing in England. He discusses the effects of climatic factors, the choice of varieties and rootstocks and the rejuvenation of old orchards.

666. GORJACZKOWSKI, W. 634.1/7

Sad Pomologiczny Zakładu Sadownictwa Szkoły Głównej Gospodarstwa Wiejskiego w Skierniewicach. (**The pomological garden of the Institute of Fruitgrowing at Skierniewice.**)

*Ann. Sci. hort., Warsaw*, 1937, 4 : 207-25.

Varieties of fruit, small fruit and nuts grown in the Institute's garden at Skierniewice are listed.

667. FISHER, A., AND SCHMIDT, M. 634.1/2-1.523

Wilde Kern- und Steinobstarten, ihre Heimat und ihre Bedeutung für die Entstehung der Kultursorten und die Züchtung. (**Wild pome and stone fruit species, their origin and their importance for the breeding of new cultivated varieties.**)

*Züchter*, 1938, 10 : 157-67, bibl. 44.

A brief review of the more important recent discoveries on this subject.

668. RYABOV, I. N. 634.2-1.551

**Selection of stone fruit varieties and strains for the canning industry in South Russia.** [Russian.]

*Fruits and Vegetables, Moscow*, 1938, No. 5, pp. 62-5.

A graph is given showing the ripening periods for a selection from some 1,000 stone fruit varieties studied at the Nikita Botanic Garden for many years. There are indications that a large-scale production of the varieties of cherries, apricots, plums and peaches in the canning centres in South Crimea would mean uninterrupted work of the canning industry for over 4 months.

669. UPSHALL, W. H., AND VAN HAARLEM, J. R. 634.25

**The "V" peaches.**

*Bull. Ont. Dep. Agric.* 389, 1938, pp. 7.

The distinguishing characters of Vimy, Vendette, Valiant, Viceroy and Veteran peaches are here described and illustrated in order to clear up the existing confusion in nomenclature of the so-called "V" peaches originating at the Ontario Horticultural Experiment Station, Vineland. A few notes are also given on their commercial value.

670. PERSSON, G. R. 631.521 : 634.1/2

Det ljusnar i sortfrågan. (**Selection of fruit varieties.**)

*Sverig. pomol. Fören. Årsskr.*, 1938, 39 : 1-9.

A list of 41 apple, 22 pear and 7 plum and cherry varieties is given, which are mainly grown in the bigger orchards in Kristianstad län, and are gradually replacing other varieties. Recommendations are made as to the apple and pear varieties most suitable for the conditions obtaining.

#### *Breeding.*

671. SPINKS, G. T. 634.13-1.523

**Pear breeding investigations.**

*Annu. Rep. Long Ashton Res. Sta. for 1937*, 1938, pp. 15-30.

Pear breeding experiments have been in progress at Long Ashton since 1920 with the object of producing new sorts which would combine high fruit quality with good regular cropping and,

if possible, resistance to disease. Conference was the male parent in all cases and the female parents were Doyenné du Comice, Durondeau, Dr. Jules Guyot, Louise Bonne of Jersey and Williams Bon Chrétien. The number of seedlings raised so far in each family varies from 9 to 50. Observations made on various fruit characters, season of blossom and fruit and on susceptibility to disease are noted. The range of variation in all particulars has usually extended beyond that of the parents. The total number of selections offering promise of fulfilling the demands made are 16 (out of 114) and these are being propagated and submitted to further trial. Particulars of characters found in the new seedlings are tabulated.

672. HOWLETT, F. S. 634.11 : 581.162.4  
**Factors affecting the rate and course of development of the female gametophyte in apple varieties.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 105-10, bibl. 5.*

In this paper the results of the microscopical development of the female gametophyte up to the maturation of the embryo sac is described, seven diploid and five triploid apple varieties providing the experimental material.

*Propagation.\**

673. WIERSZYŁOWSKI, J. 634.13-1.535  
 Obserwacje nad wegetatywnym rozmnażaniem grusz zapomocą sadzonek.  
 (Some observations on the vegetative propagation of pears from cuttings.)  
 [English summary 15 lines.]  
*Ann. Sci. hort., Warsaw, 1937, 4 : 125-36, bibl. 17.*

A study was made in 1936-7 at the Institute of Pomology, Warsaw, of the vegetative propagation of pears by means of cuttings. Hotbeds (20-30° C.) with a top layer of 10 cm. of wet washed river sand were used. Cuttings from one-year-old trees taken from apical semi-lignified shoots proved the most suitable. Cuttings of various species and varieties did not root equally well, and when rooted developed different root systems showing considerable differences in growth. Data are tabulated.

*Rootstocks.*

674. TYDEMAN, H. M. 634.14-1.541.11  
**The wild fruit trees of the Caucasus and Turkestan. Their potentialities as rootstocks for apples and pears. I. A first report on some wild quinces from the Caucasus.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 103-16, bibl. 7.*

From among the millions of deciduous fruit trees growing wild in the Caucasus between the Black and Caspian seas and in Turkestan it seems possible that some may possess qualities of disease resistance, productivity or vigour which may prove useful to the commercial fruit grower in other lands. It would even appear possible that such a degree of uniformity may be found among seedlings as eventually to make the vegetative propagation of rootstocks unnecessary. In this paper the author gives an account of 365 quince seedlings raised from the seed of 6 single tree selections collected in the Caucasus and received at East Malling from the Department of Plant Introductions and New Cultures, Leningrad, in 1931 and sown immediately. Some 79% of the seed germinated and the seedlings were planted out at 2 ft. apart in rows 3 ft. apart. In the winter of 1933 they were cut down and mounded up to form stools. A fair proportion rooted satisfactorily and grew fairly satisfactorily. Botanical descriptions of the chief types are given. One type resembles Malling quince C. The stools were budded with Conference, Dr. Jules Guyot and Marie Louise during the autumn of 1936. The take of buds was in general fairly satisfactory and Conference grew satisfactorily on nearly all the stools. The buds of Dr. Jules and Marie Louise, however, which have previously proved incompatible with varieties of quince hitherto in commercial use, made most unsatisfactory growth on most of the stools.

\* See also 647, 648.



Little correlation was established between the relative vigour of the unworked quinces and that of the pear varieties worked upon them. As regards botanical variation the quince seedlings were found to be strikingly uniform in most of their characters. Some variations were noted in the time of leafing out in spring, but the most striking differences were those associated with the folding of the leaf surfaces and the manner in which the leaves were held relative to the main axes of the shoot. Judging by these the author was able to classify them into 5 distinct groups.

675. WIERSZYŁOWSKI, J. 634.13-1.541.11  
 Studia nad gruszą "Kaukaską" jako podkładką. (The "Kaukaska" pear, a possible rootstock for pears.) [English summary 17 lines.]  
*Ann. Sci. hort. Warsaw*, 1936, 3 : 262-83, bibl. 6.

Seedlings of 7 varieties of common pear were tested at the Institute of Pomology, Warsaw, for 3 years as to their suitability as rootstocks for pears. "Kaukaska" pear proved the best, its advantages being as follows:—Vigorous growth; resistance to leaf blight, spring frosts, and crown gall; a well-developed root system; a wide range of variation in thickness of stem suitable for budding; the highest percentage of take of the stocks tried; vigorous growth of intermediate stem piece when double worked and satisfactory healing of wounds after pruning.

676. KEMMER, E. 631.541.11 : 634.1/2  
 Die Bedeutung des Sämlings als Unterlage. (The importance of the seedling as a rootstock.)  
*Forschungsdienst*, Sonderheft 8, 1938, pp. 383-6, bibl. 3.

In 1930 studies on seedling rootstocks were begun by the Institut für Obstbau in Germany. The results so far obtained may be summarized as follows:—1. Triploid varieties proved unsuitable for the production of seedlings; compared with diploid varieties they produce not only a higher percentage of non-viable seeds (over 50%), but also inferior plants. 2. The diploid apple varieties tested gave 80% germination and pears 65-70%, most of the seedlings being strong and healthy. From the seed of triploid varieties only 30% germination was obtained in apple and 10% in pear, while only a few of the seedlings were robust. The results of these studies of some 60 apple and pear varieties are considered all the more important in view of the fact that the use of seeds of triploid varieties such as "Rheinischer Bohnapfel" is still recommended by certain authorities for rootstock propagation. Of the diploid forms some varieties such as Adersleber Kalvill and Cox's Orange Pippin were also found unsuitable as seed parents. 3. Contrary to common opinion, no evidence has as yet been forthcoming in these trials that variations in growth are greater with seedlings than with clones. Practically no data are yet available as to degrees of compatibility between stocks and scions. The studies in progress with stone-fruits indicate that similar results may be expected with them.

677. ROEMER, T., KRÜMMEL, H., AND HILKENBÄUMER, F. 634.1/7-1.541.11 : 581.084.2  
 Die obstbauliche Forschung des Institutes für Pflanzenbau und Pflanzenzüchtung und die Aufgaben der Obstversuchsstation Schraderhof in Gross-Ottersleben. (The fruit research work of the Halle Institute for Plant Industry and Plant Breeding and the tasks of the Schraderhof Fruit Research Station at Gross-Ottersleben.)  
*Kühn-Arch.*, 1938, 50 : 339-96.\*

An account of the Schraderhof estate on which, as on many other private estates in Central Germany, a number of experiments have in the past been made by co-operation of owner and research worker. is followed by a detailed description of the carefully prepared experiments on

\* Includes 27 pages of illustrations of exact plot arrangements.

known rootstocks laid out by the Halle Institute mainly in 1935/36 at different places in the province of Saxony and Anhalt. Their chief expressed aims are (1) to carry on work previously initiated at Schraderhof on varietal and other problems in stone and pome fruits, and to study the effect of scion rooting and top working on vegetative and productive growth; (2) to test new varieties and rootstocks; (3) to compare the value of different stocks, stem builders and pruning systems.

The greatest care was taken in preparing the material, some of it being worked by Maurer at Berlin, some at reliable nurseries. The combinations were then planted out under as varying conditions as could be obtained. Thus apple rootstock trials are laid out at 6 different centres, pear trials at 8, plum trials at 4, etc. To show the scale of the experiments the following example may be noted:—Some 914 high bush apple trees were planted at Langenstein on 26 known rootstocks (i.e. the Malling selections, Pillnitz selections, Hüttner selections and seedlings), 5 scion varieties being used in 73 combinations of stock and scion, the area covered being 3.5 ha; at Klötze 1,087 apple trees were used covering 4.0 ha. and at Köckte 108 trees on 0.6 ha. Pears, acid cherries, plums, peaches and apricots are being tested on much the same scale. It is proposed to carry out exact and comprehensive observations every year on growth, blossoming and cropping and on resistance to pests, diseases and frost. Illustrations are given here of the exact lay out of individual trees on 26 plots at the different centres. Soils vary from light sandy with high atmospheric moisture and rainfall and good water conditions to very good fruit soils but with lower moisture content.

The units of trees on a single variety on each stock in any one trial appears to vary from 6 to 16. No attempt is made to lay out the experiment in accordance with modern statistical ideas. The arrangement is systematic with, for instance, in the plots of apples planted alone, a row of, say, Ontario followed by a row of Beauty of Bath, and, running across the plot a row of No. IX stock followed by a row of No. VII and so on.

This comprehensive set of experiments on the lines of the original rootstock experiments at East Malling laid out more than 20 years ago, but comprising a considerably larger number of stocks than was available at East Malling, should gradually yield valuable results. They will be awaited with great interest.

678. LEONARD, E. R. 634.11 : 581.144.4 : 581.192 : 631.541.11  
**Preliminary observations on the carbohydrate content of apple leaves on different rootstocks.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 173-80, bibl. 4.*

The author describes the preparation of material and briefly the methods adopted for determining the carbohydrate content of Lane's Prince Albert apple leaves on apple rootstocks No. IX and No. XII. Preliminary estimations of the alcohol-soluble reducing substances present indicated that quantitative differences exist and that the leaves on the No. IX (dwarfing) stock have a consistently higher content of these substances throughout a 24 hour cycle than leaves on the vigorous No. XII.

679. GARNER, R. J., AND HAMMOND, D. H. 634.25-1.541.11-1.541.12  
**Studies in incompatibility of stock and scion. II. The relation between time of budding and stock scion incompatibility.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 154-7, bibl. 4.*

Buds of Hale's Early Peach were inserted at weekly intervals during the budding season, i.e. 24 June to 26 August, into one compatible, Brompton, and one incompatible, Myrobalan B, clonal rootstock. They all gave rise to trees typical of the expected compatible and incompatible stock-scion combinations respectively. There was no indication that time of budding had any lasting effect on compatibility.



*Rootgrowth.\**

680. ROEMER, T., AND HILKENBÄUMER, F. 581.144.2 : 634.13 + 634.23  
 Weitere Beobachtungen über das Wurzelbild 20-jähriger Birnen- und  
 Sauerkirschenbüsche. (**Further observations on the root formation of 20-year-  
 old pear and acid cherry trees.**)  
 Reprinted from *Kühn-Arch.*, 1937, 44 : 105-20.

In addition to the studies made of the roots of 25-year-old apples and pears on drawing stocks at Dirmstein, roots of 51 bush trees were studied at Limburgerhof. The varieties were Vicar of Winkfield, Le Lectier and Duchesse d'Angoulême on quince stocks, Williams on pear seedling and shade morello on mahaleb seedling. The following conclusions were reached :—1. Most of the roots of pears on quince and of morello on mahaleb seedling lie at a depth of 15-25 cm. and in the case of pears on pear seedling at 35-50 cm. Many roots lie only 5-10 cm. below the surface. Some pear roots of trees on quince and seedling stocks were found to change abruptly the horizontal course followed hitherto and at some point to dip down vertically for no apparent reason or rule until they reached the depth of 150-200 cm. where they forked out in a water bearing layer. Neither pear seedlings nor mahaleb seedling formed tap roots. The strongest roots were formed in the soil layers near the surface. 2. The influence of the scion on the shape and formation of the root crown can be seen more clearly on the sandy soil at Limburgerhof than on the loess loam at Dirmstein. Scion influence on stock is so pronounced that it overshadows the quite definite soil influences and remains clearly perceptible on all three soils. Its effects, which can be so clearly seen in the amount of fibre, the formation and shape of root crowns and of individual roots, and the angles made on forking, confirm the existence of a definite qualitative influence exerted by the scion on the stock.

*Pollination.†*

681. OVERLEY, F. L., AND OVERHOLSER, E. L. 634.11 : 581.162.3  
**Commercial pollination of apples in Washington.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 39-42.*

Tests of hand pollination on a commercial scale in Washington orchards show the practice to be profitable when there are solid blocks of self-sterile varieties or poor insect activity due to wind or other climatic factors at blossom time. The pollen is collected from early blooming sections by removal of flower clusters and separation out of the anthers by rubbing the flowers over a No. 12 wire screen. It is then dried in paper trays for 36-48 hours at room temperature. It is applied with a No. 7 pig's hair brush and a skilled operator will apply pollen to 1 or 2 flowers of about 1 out of every 4 or 5 spurs on a 20-year-old apple tree in  $\frac{1}{2}$  to 1 hour.

682. COOPER, J. R. 634.11 : 581.162.3  
**Factors influencing fertilization of apple blossoms and setting of fruit.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 27-35, bibl. 30.*

The author divides the factors which influence fertilization and set of apple blossom into two classes, namely those influencing it indirectly through their effect on the health and vigour of the tree, e.g. manuring, pruning and cultural practices, and the inherent physiological or genetic characters which directly affect pollination and set. The latter, particularly incompatibility, self-sterility and inter-sterility, were the subject of investigations described here in some detail.

683. GORJACZKOWSKI, W. 634.1/2 : 581.145  
 Daty kwitnienia drzew owocowych w Sadzie Pomologicznym Zakładu Sadownictwa S.G.G.W. w Skierniewicach. (**Flowering dates of fruit trees in the pomological garden of the Institute of Fruitgrowing, at Skierniewice.**)  
*Ann. Sci. hort., Warsaw, 1937, 4 : 197-206.*

Tables show the flowering dates recorded at Skierniewice for the different varieties of sweet and acid cherries, plums and apples during the period 1932-7 and for pears in 1937.

\* See also 637-641, 699.

† See also 760.

684. TYDEMAN, H. M. 575.18 : 634.11 + 634.13  
**The influence of different pollens on the growth and development of the fruit in apples and pears. I. A progress report on experiments carried out during 1937.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 117-27, bibl. 11.*

An account is given of the observations on fruit development made after pollinating 6 varieties of apple with 18 different pollens and 5 varieties of pear with 14 different pollens. Comparatively large differences were apparent in the size of fruits of each variety within the first few weeks after pollination, but these differences became smaller and by the time the fruits were ripe they were almost negligible. This reduction in differences was associated with fruit drop. In all the crosses studied it was the smaller fruits that fell, irrespective of pollinator. The differences in final weight between fruits of any one variety differently pollinated were considerable—up to 10%. Rather large differences were also found in average seed content of the fruits, but the larger fruits did not always have the most seeds.

685. SRIVASTAVA, D. N. 634.13 : 581.145 : 551.56  
**Studies in the non-setting of pears. II. The effect of weather conditions.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 128-44, bibl. 16.*

The previous history of weather and cropping in 1934 and 1935 was duly considered by the author when attempting to compute weather effects on the cropping in 1936 and 1937 of 4 pear varieties. The severe frost of May 1935 destroyed all blossom set in that year. The trees thus had an extra amount of food reserve and so yielded abundantly in 1936. Conditions were then reversed for the 1937 crop which was a failure. From soil moisture records it was found that the June drop period in two years synchronized with the beginning of the drying out of the soil and it may be that the general tightening up of moisture conditions at a critical period of leaf and fruit expansion encourages fruit drop. The sheltering of trees from strong winds gave indication of increased blossom set and sunshine appeared to affect set, most of the crop being borne on the south side. The fact that trees on one particular rootstock [quince C.—ED.] gave the greatest set of blossom goes to support the theory that the essential problem is one of nutrition.

686. SRIVASTAVA, D. N. 634.13 : 581.46 : 581.162.3  
**Studies in the non-setting of pears. III. The effect of the flower characters.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 145-53, bibl. 16.*

The characters studied for 2 seasons in Conference, a free cropper, and in the shy croppers, Comice, Beurré Hardy and Pitmaston Duchess, were size of blossom, relative length of styles and stamens and the incidence and effect of protandry or protogyny. Contrary to popular opinion the size of blossom as between different varieties did not seem to have any relation to set of blossom, but within any one variety the blossom was larger in the year of heavy set than in the year of poor set. It was found that in Conference the peculiar bending over of the styles in the early stage of the flower favoured self pollination. In Beurré Hardy the maturity of the flower is considerably delayed and thus its chances of cross pollination are lessened. In Comice the period of stigma receptivity is so short as to make it likely for pollination not to take place. Conditions are ideal for self-fertility in Pitmaston Duchess, but being a triploid most of its pollen is sterile and the process cannot therefore be complete.

687. BOWMAN, F. T. 634.23 : 581.162.3  
**Cherry pollination and variety investigations in New South Wales 1930-4.**

*N.S.W. Sci. Bull. Dep. Agric. S. XXX, 55, 1937, pp. 51, bibl. 62.*

Self- and cross-pollination studies with the principal cherry varieties in New South Wales are reported and the more recent literature on the pollination of sweet cherries is reviewed. Data are given on the order of blossoming of cherry varieties, important variations between trees of the same variety being noted. The inter-sterility and partial incompatibility of certain varieties are discussed as well as the value of cross-pollination, the seasonal influences, the choice of



pollinators and methods of introduction, handling of bees and other practical points. The identity and commercial value of some cherry varieties is described briefly. Off-type strains of Early Lyons, which were found to be of common occurrence, are also described. The variant types of St. Margaret are stated to be partly due to rootstock influence and partly to impurity of variety. Careful bud selection is recommended for the propagation of suitable types. The report is amplified with figures and tables.

688. SUSA, T. 634.1/7 : 581.162.3  
**Pollen tube behavior on the artificial media in deciduous fruits with special reference to sterility.** [Japanese, English summary 2 pp.]  
 Reprinted from *J. Sapporo Soc. Agric. For.*, 1936, **28** : 167-94.

As a sequel to pollination studies which have been in progress for some years the author claims to have discovered some of the causes of the abnormal behaviour of pollen tubes of certain fruits which results in sterility.

*Growth and nutrition.*

689. VERNER, L. 634.11 : 581.145.2  
**A study of growth rates in Stayman Winesap apples.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35* : 128-31, bibl. 4.

Measurements were made for a period of 7 weeks at 24-hour intervals of the growth of Stayman Winesap apples at the West Virginia Experiment Farm, where the soil, a fertile, fairly heavy clay loam, was at the time carrying a fairly dense crop of weeds. The environmental factors likely to affect growth were also plotted over the same period, namely mean air temperature, total rainfall and total evaporation. Soil moisture was abundant. Fluctuations in evaporating power of the air were found to correspond most closely with the major fluctuations in fruit growth. Thus, on days when total evaporation was appreciably lower than on the previous day, the rate of fruit enlargement usually showed a corresponding increase over that of the preceding day, and when evaporation suddenly rose the growth rate generally declined.

690. DAVIDSON, O. W., AND BLAKE, M. A. 634.25-1.821-1.83  
**Nutrient deficiency and nutrient balance with the peach.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35* : 339-46, bibl. 4.

Experiments were started in 1937 at New Jersey Agricultural Experiment Station to investigate the influence of the calcium-potassium ratio on the growth of peach trees. The trees were 1-year-old Eclipse, 2 feet in height, top and root pruned to uniformity and grown for the purposes of the experiment in sand. *Low calcium + high potassium treatments.* Trees receiving 2 parts per million Ca + high K grew more than twice as fast as plants receiving no external supply of Ca but developed calcium deficiency symptoms 13 days before the latter. Treatment of 2 parts per million Ca + medium K showed only a mild calcium deficiency but tree growth was much lessened. Trees supplied with 10 parts per million Ca + high K grew as fast and developed as large leaves as those receiving complete treatments, but subsequently developed severe foliage symptoms of deficiency, about a week later than plants receiving no Ca. Ten parts per million Ca + medium K gave results nearly entirely comparable to those shown by trees receiving complete treatment but produced slightly thicker and more leathery leaves. *Low potassium + high calcium treatments.* Treatments of 2 parts per million K + high Ca and of no K gave about the same amount of linear growth, which was considerably less than that resulting from 2 parts per million K + medium Ca. Trees receiving 10 parts per million K + medium Ca showed no definite external symptoms but made about 25% less growth than did trees in the complete treatment. In contrast, trees in 10 parts per million K + high Ca grew slowly but developed definite foliage symptoms of potassium deficiency. In all the treatments tissue tests were in close agreement with the external responses. In conclusion it is pointed out that the development of nutrient deficiency in the peach is therefore dependent primarily upon 2 factors, (a) the rate of growth of the trees, and (b) a failure of the root medium to supply the limiting nutrient

in amounts and proportions adequate for that rate of growth. It has been demonstrated that an adequate amount of a nutrient is definitely dependent on the rate of growth of the tree and that this adequate amount may vary with the concentrations of other nutrients present in the root medium.

#### Soils.

691. BIAŁOBOK, S. 631.4 : 634.11 + 634.22  
Przyczynek do badań nad wpływem warunków glebowych na wzrost jedno i dwuletnich drzewek owocowych w szkółce. (**The influence of soils on the growth of 1- and 2-year-old grafted apple and plum trees.**) [German summary 1 p.]

*Ann. Sci. hort., Warsaw, 1937, 4 : 103-24, bibl. 14.*

Growth measurements were taken of young apple and plum trees on different types of soil in Poland. From the records taken the following observations were made: 1-year-old apples of the variety Cronicel's grew more vigorously on the sandy loams overlying a marl subsoil than on a diluvial loess soil. 1-year Antonowka maidens grew equally strongly on both soil types. Landsberger Renette developed healthier plants on sandy loams rich in humus than on sandy loams over marl. 2-year-old Cronicel's and Antonowka apples grew most vigorously on sandy loams rich in humus, less so on the diluvial loess and least on sandy loams over marl. The differences in shoot growth in one-year-old grafted trees was greater than in two-year-old trees.

692. BIAŁOBOK, S. 634.11-1.8  
Przyczynek do poznania wpływu zawartości składników pokarmowych w glebie na płodność i niepłodność odmian jabłoni: Boskoop i Królowej Renet. (**On the influence of nutrients present in soils on the relative fertility of Boskoop and Gold Pearmain varieties.**) [German summary 1½ pp.]  
*Ann. Sci. hort. Warsaw, 1936, 3 : 197-217, bibl. 36.*

Data are tabulated and discussed on the nutrient deficiencies found to be present in soil round heavy cropping and low cropping Boskoop and Gold Pearmain apple trees 30-50 years old on seedling stocks. Although there were marked deficiencies in the soil from infertile Boskoop trees, it is noted that the lack of fertility may well have been due to other causes such as inadequate rainfall, etc. Data from tests of soil from Gold Pearmain orchards were even less conclusive.

693. HALLER, M. H., AND HARDING, P. L. 634.11-1.432  
**Relation of soil moisture to firmness and storage quality of apples.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35, 205-11, bibl. 9.*

In experiments with apples from irrigated and non-irrigated plots it appeared that the benefits from the greater yield and higher quality of apples grown with ample soil moisture far outweighed the detriment of the shorter storage life which seems to be the corollary. Results have indicated that fruit grown in seasons of ample rainfall should not be held in storage so long as those that have been grown with somewhat deficient soil moisture.

#### Manuring.\*

694. RYALL, A. L. 634.13-1.432  
**The effects of water supply to the tree upon water content, pressure test and quality of Bartlett pears.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 283-8, bibl. 6.*

Reduced water supply to Bartlett pear trees during the summer as indicated by reduced rate of fruit enlargement resulted in a decreased proportion of water to total solids in fruit at harvest. Decreased proportion of water to total solids was correlated with a higher pressure test of fruit

\* See also 649, 650, 653-655.



during all except the end of the harvest period. Reduced water supply to the tree during the summer resulted in less rapid development and less amount of core breakdown of fruit upon ripening after cold storage. [From author's summary.]

695. BRYANT, L. R., AND GARDNER, R. 634.23-1.8  
**Fertilizer trials with sour cherries under limited irrigation. I. Yields and fruit size.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 347-51, bibl. 6.*

The experiments were conducted with mature Montmorency cherries spaced 16.5 ft. × 16.5 ft. in fine sandy loam of rather low fertility, and usually insufficiently irrigated. Two years yield data indicate that the use of nitrogen alone gave the greatest increase in yield, but, since stable manure had a progressive carry over effect from year to year, it is possible that yield increases from its use may be comparable to or even greater than those following the application of a nitrogen bearing fertilizer alone. Yield increases following NP and PK were far below those obtained with nitrogen or manure alone. There was no increase in fruit size in any treatment.

696. SMITH, G. E., AND MURNEEK, A. E. 634.11-1.841.5  
**Comparative value of cyanamid in fertilization of apple trees.**

*Res. Bull. Mo. agric. Exp. Sta. 273, 1938, pp. 52, bibl. 54.*

For several years fertilizer trials were carried out at the Agricultural Experiment Station of the University of Missouri. The amounts of nitrate and ammonia nitrogen were determined in soil samples taken at various depths under mature trees growing on sod and manured respectively with cyanamide, ammonium sulphate, and sodium nitrate in the autumn and in spring. Under highly moist conditions cyanamide decomposition was rapid and in a few days the ammonia concentration in the soil was almost as high as from manuring with ammonium sulphate. When no rain fell shortly after the application of cyanamide, the amount of available nitrogen in the soil was reduced below that derived from the use of the other two fertilizers. Apparently part of the cyanamide nitrogen had either been lost or bound by some biological or physical process. There was a significant and quite similar soil penetration of ammonia from cyanamide and ammonium sulphate under optimal weather conditions. Very little variation was observed in rates of nitrification of nitrogen from cyanamide and sulphate of ammonia, but the rapid absorption of nitrogen by the trees from these materials indicated that this transformation may not be necessary. If the ammonia content resulting from the application of fertilizers is taken as a measure of the residual effect, then greater soil retention of nitrogen results from the use of ammonium sulphate than from that of cyanamide. The nitrate form of nitrogen was taken up more rapidly by the trees than the ammonia form, but the ammonia continued to be absorbed over a longer period. Sod was a serious competitor for nitrogen applied in the spring. This was in part responsible for the efficient utilization of nitrate of soda in the autumn and the good results obtained from the spring application of cyanamide, which has a temporary caustic effect on grass. Differences in growth and in nitrogen content of the developing parts of the fertilized trees were insignificant but correlated well with variations in the available nitrogen of the soil. All forms of nitrogen fertilizers gave equally good, if not better, results in the autumn than in the spring. Under favourable conditions there was little difference in growth and nitrogen recovery from the three fertilizers used and cyanamide proved as satisfactory a fertilizer for apple trees as sulphate of ammonia and nitrate of soda.

697. BAKER, C. E. 631.874 : 631.45  
**Changes in total soil nitrogen under each of several cover crops after 23 years.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 306-7, bibl. 1.*

No cover crops of a number tried, both leguminous and non-leguminous, had succeeded in maintaining the original nitrogen content of an orchard plot after a 23 year period. Even the most successful, millet, early rye and vetch, permitted a loss of 20%.

698. PROEBSTING, E. L. 631.874 : 631.45  
**The effects of cover crops on nitrogen and field capacity in an orchard soil.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 302-5, bibl. 2.*

Under warm semi-arid conditions in Davis, California, in an irrigated orchard, cover crops have not increased either the nitrogen of the soil or the moisture holding capacity of the soil during a 10 year period.

699. BATJER, L. P., AND SUDDS, R. H. 634.11-1.84 : 581.144.2  
**The effect of nitrate of soda and sulphate of ammonia on soil reaction and root-growth of apple trees.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 279-82, bibl. 4.*

The report describes the cumulative effect on the properties of the soil and on the root growth of apple trees of 11 years use of the fertilizers ammonium sulphate and sodium nitrate. The trees were 25 years old at the start. From trench and tube sampling methods it appeared that the nitrated trees had made the greater root growth, root weights being usually more than double those of the sulphated trees and in relatively few instances less than half. The roots receiving nitrate were fibrous and of a dark chocolate colour while the sulphate roots were light yellow-brown and rather coarse and stringy. The acidifying effect of the sulphate and the alkalizing effect of the nitrate resulted in a difference in the pH of 2.3 in the top five inches and 0.41 at 16-20 inches. Since it has been found elsewhere that the use in a clay loam and in a sand loam of a combination of sodium nitrate and ammonium sulphate, in which the proportion of nitrogen in the 2 fertilizers was in the ratio of 3 to 1, left the soils at their original reaction, it would seem that a soil reaction could be held relatively constant so far as the residual effects of the fertilizers are concerned by the use of ammonium sulphate every 4th year in combination with equivalent applications of sodium nitrate during the other 3 years. The differences in yield and top growth between these two fertilizers were not significant. The great differences in root growth is tentatively attributed to the possibility that the H-ion concentration of the soil in the case of the sulphated trees was so low as to be directly injurious to the roots, but since it was not spread over the entire surface area of the soil covering the tree roots, and since its apparent effects were confined chiefly to the surface 20 inches of soil, there might not have been developed sufficient root injury over a period long enough to produce visible injury to the growth of tops. The possibility of the existence of similar or related effects on other fertilizer projects is, the authors conclude, worthy of very serious consideration in interpreting results in such fertilizer tests in orchards.

700. PARTRIDGE, N. L., AND TOENJES, W. 631.874  
**Annual cover crops for Michigan orchards.**  
*Circ. Bull. Mich. agric. Exp. Sta. 163, 1937, pp. 12.*

The problem of supplying humus to the soil and its relation to crop growth is discussed under the following heads:—(1) comparative advantages of sod and cultivation, (2) the value of orchard cover crops, (3) choice of cover crops, (4) the best time to seed cover crops, and (5) the necessity for cultivation to be across the slopes. The material presented here is based on data obtained from orchard tests in Michigan and elsewhere and from recently published works on related subjects.

701. MINISTRY OF AGRICULTURE, LOND. 631.87  
**Composts.**  
*Adv. leafl. Min. Agric. Lond., 289, 1937, pp. 4.*

Notes on compost making and the acceleration and control of the rotting process.



*Cultural practice.*

702. SWARBRICK, T. 631.543 : 634.1/2-2.118 + 2.69  
**Notes on some methods of staking and guarding orchard trees and their costs.**  
*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938, pp. 57-64.*

Five methods of staking and guarding orchard trees from the effects of wind and vermin are described in detail with illustrations, notes being given of preparation of stakes and technique of erection and costs.

703. WAGNER, G. 631.546 : 634.1/2  
 Der Spindelbusch, eine neuzeitliche Obstbaumform. (The spindle-bush—a modern cordon training method.)  
*Obst. u. Gemüseb., 1938, 84 : 75-6.*  
 ILLING, G.  
 Nochmals der Schnurbaum. (A cordon training method.)  
*Obst. u. Gemüseb., 1938, 84 : 76-8.*

In both articles a special method of training cordons is described and in the second illustrated, namely the "Spindelbuschbaum" method by which the single stem is bent into an arc while thereafter similar action is taken periodically with a single shoot selected from the summit of the arc below, the tree ascending the supporting trellis at an angle of 45° in a succession of semi-circles. The most suitable stocks for such forms are for apples type IX, and for pears quince. Some suitable apple scion varieties are recommended. Vigorous scion varieties on vigorous stocks are unsuitable. This form is considered as ideal for small but not large orchards.

704. SWARBRICK, T., AND BERRY, W. E. 631.542 : 634.11  
**A comparison of pruning treatments in relation to apple-tree shape.**  
*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938, pp. 31-56, bibl. 5.*

Pruning trials are described on Worcester Pearmain, Cox's Orange Pippin, Allington Pippin, Edward VII and Early Victoria planted as 1-year-old whips on Malling No. 2 rootstock in 1926. The treatments included :—1. regulated—winter pruned ; 2. open centre—winter pruned ; 3. open centre—summer and winter pruned ; 4. modified leader—winter pruned ; 5. modified leader—summer and winter pruned. Among conclusions reached by the authors are the following :—modified leaders take longer to prune than open centres ; any kind of winter pruning reduces tree size, but the addition of summer pruning reduces it still more ; blossom production is greatly reduced by any kind of winter pruning. Summer pruning increases the proportion of spur to terminal and lateral blossoms ; open centre trees generally produce rather bigger crops than modified leaders ; summer pruning improves both colour and size of fruits especially on open centre trees ; modified leader trees have stronger branches and offer advantages in management.

705. MURNEEK, A. E. 631.542.24 : 634.11  
**Branch ringing and fruit set of Minkler and Arkansas (Black Twig) varieties of apple.**  
*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 24-6, bibl. 5.*

The author concludes from his present experiments on 4 apple trees and from previous experiments by himself and others that successful fertilization and fruit setting through the first fruit drop is in all probability chiefly influenced by pollination and nitrogen supply, while later fruit drops can apparently be considerably checked by ringing, which modifies the distribution and concentration of carbohydrates.

706. GRUBB, N. H. 634.11-1.542  
**Winter pruning of apple trees. Some advice based on the East Malling experiments.**  
*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 237-41.*

*Early years before cropping.* In the Malling trials this stage was not adequately dealt with. All trees were cut hard for two years after planting and before the different pruning treatments

started. The author after reviewing the various treatments possible concludes that it is usually best to choose a form of tree and method of obtaining it which involve a minimum of leader tipping. *Early cropping years.* Advice is given on the amount of leader tipping needed, the treatment of laterals and spur pruning, etc., in various cases. *Maturity.* Pruning here depends on condition and vigour of trees. Vigour must be maintained, whether by pruning, manuring or cultivation or combination thereof. It is rarely satisfactory to leave a mature tree entirely unpruned for more than one or two years. Pruning in relation to biennial bearing is also discussed.

707. UPSHALL, W. H. 634.1/2-1.542  
**Pruning the tree fruits.**  
*Bull. Ont. Dep. Agric.* 392, 1938, pp. 23.

In this bulletin the basic principles applicable to the pruning of apple, cherry, peach, pear and plum are described, notes being given on pruning tools, the types of head to be aimed at in initial pruning, methods of training and pruning bearing trees. The bulletin is well illustrated.

*Harvesting, recording, etc.*

708. VAN HAARLEM, J. R. 631.547.6 : 634.1/7  
**Maturity dates for some fruit varieties.**  
Reprinted from *Can. Hort. Home Mag.*, April 1938, pp. 7.

Charts show maturity, i.e. first picking date, for some varieties of strawberries, raspberries, cherries, peaches, apples, plums, pears and grapes as recorded at the Horticultural Experiment Station, Vineland, Ontario. It is considered that, subject only to slight adjustments necessary for any given fruit districts in the province, the chart should prove a reliable general guide.

709. HOBLYN, T. N., AND EDGAR, J. L. 634.11-1.56  
**Experiments in sampling technique. II. Size and colour of Allington Pippin—1936 crop.**

*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 168-72, bibl. 3.

An experiment in sampling the crops of 14-year-old Allington Pippin trees, with a full crop, for size and colour of fruit, is described. It is concluded that with normal replication of such trees it is only necessary to grade about  $\frac{1}{8}$  of the crop of each tree, selected at random from the whole, to obtain reasonably accurate estimates of the average size and colour "figures", usually computed for comparison of these characters. [Authors' summary.]

710. POTTER, G. F. 581.45 : 634.11  
**Photoelectric measurements of apple leaf areas.**  
*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, 35 : 260-2.

An instrument constructed by the author for the photoelectric measurement of leaf areas is described and some problems encountered which are not usually mentioned in the literature are discussed.

#### SMALL FRUITS, VINES, NUTS.\*

711. SCHWARTZ, C. D. 634.711  
**The Washington and Tahoma red raspberries.**  
*Pop. Bull. Wash. agric. Exp. Sta.* 153, 1938, pp. 10.

Washington and Tahoma, new hardy red raspberry hybrids, are described. The varieties, of which the former was produced by crossing Cuthbert and Lloyd George and the latter by crossing Lloyd George and Latham, have been developed through the co-operation of the Washington Agricultural Experiment Station at Pullman and the Western Washington Experiment Station at Puyallup. Both are remarkable for vigour and winter hardiness.

\* See also 630.



712. MORRIS, H. F. 634.715 + 634.717

**Blackberry and dewberry varieties in East Texas.**

*Bull. Tex. agric. Exp. Sta.* 558, 1938, pp. 30, bibl. 17.

The results of tests over 5 years of 72 varieties and selections of blackberries and dewberries at the Texas Agricultural Experiment Station are presented. Greatest yields were obtained from varieties ripening early to mid-season, all having trailing canes. All late varieties were found very highly susceptible to diseases and produced unsatisfactory yields. The Young and Boysen dewberries had larger size and better quality fruits than other varieties.

713. BAILEY, J. S. 634.717 : 581.162.3

**The pollination of the cultivated blueberry.**

*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, 35 : 71-2.

Experiments conducted on blueberries at the Massachusetts Experiment Station in 1935 and 1936 indicate that under Massachusetts conditions none of the varieties Adam, Cabot, Dunfee, Grover, Harding, Katherine, Pioneer or Rubel can be relied on to give a consistently good commercial crop under conditions of self-pollination.

714. MORTENSEN, E., AND YARNELL, S. H. 634.75-1.523

**Breeding strawberries for Texas.**

*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, 35 : 57-9.

DRAIN, B. D., AND FISHER, L. A.

**Some strawberry breeding progeny data.**

*Ibidem*, pp. 60-6.

CLARK, J. H.

**Inheritance of the so-called everbearing tendency in the strawberry.**

*Ibidem*, pp. 67-70, bibl. 4.

Strawberry breeding work in Texas and Tennessee is dealt with in the first two articles listed above. In the third, experiments to determine the dominance or recessivity of the everbearing factor are described.

Attention is drawn to the following articles on the breeding or classification of certain fruits, published in 1934 but only recently available for noting in *H.A.* :—

715. PAVLOVA, N. M. 634.722

**Classification of the species of red currants on a genetic basis.** [Russian, English summary 2½ pp.]

*Bull. appl. Bot., Leningr., ser. VIII*, 2, 1934, pp. 87-119, bibl. 17.

ROZANOVA, M. A. 581.5 : 634.71 + 634.75

**Contribution to the question of geographical and ecological variation of characters as shown in the instances of several representatives of the genera *Rubus* and *Fragaria*.** [Russian, English summary 5 pp.]

*Bull. appl. Bot., Leningr., ser. VIII*, 2, 1934, pp. 35-84, bibl. 1 p. [mainly Russian].

ROZANOVA, M. A. 634.73

**A survey of the literature on the genera *Vaccinium* L. and *Oxycoccus* (Tourn.) Hill.** [Russian, English summary 13 lines.]

*Bull. appl. Bot., Leningr., ser. VIII*, 2, 1934, pp. 121-86, bibl. 13½ pp.

FAVORSKAYA, N. A. 588.13

**Survey of the literature on the genus *Actinidia*.** [Russian, English summary 1 p.]

*Bull. appl. Bot., Leningr., ser. VIII*, 2, 1934, pp. 187-97, bibl. 25.

NEGRUL, A. M. 634.8 : 581.163

**Contribution to the question as to parthenocarpy and apomixis in the grape.** [Russian, English summary 1 p.]

*Bull. appl. Bot., Leningr., ser. VIII*, 2, 1934, pp. 229-68, bibl. 1 p.

716. PALMER, E. F., AND VAN HAARLEM, J. R. 634.8  
**The grape in Ontario.**  
*Bull. Ont. Dep. Agric.* **391**, 1938, pp. 39.

Modern methods in the commercial cultivation of grapes in Ontario are discussed and suitable varieties are recommended for wine, market and roadside. The last term is used for grapes which will not stand up to shipment but have outstanding dessert qualities.

717. WELLINGTON, R. 634.8-1.523  
**The khalili as a parent for breeding early grapes.**  
*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, **35**: 76-9.

The khalili would appear to be of Russian (Bioletti) or Persian (Viala) origin. It is tender and needs winter protection. The fruit is long ovate, greenish yellow, slightly meaty, tender, juicy, vinous and of good flavour. It is a very early ripening variety and it shows great promise in New York State for the production of early ripening seedlings.

718. OINOUE, Y. 634.8-1.542.24  
 Contribution à l'étude de l'effet de l'incision annulaire sur la vitesse de maturation des raisins. (**Effect of girdling on rate of ripening of grapes.**) [Japanese, French summary.]  
*Bull. Inst. Oinoue, Japan*, **2**, 1938, pp. 1-7, bibl. 4.

The varieties of grapes studied were *labrusca*, *vinifera* and their hybrids. In general the effect of girdling fruiting branches is greatly to hasten the ripening of the fruit with late varieties, but with the early ones it has little effect. The effect is also greater when the girdling is done a little before the rise of the sap. As between fruit of equal weight and maturity the sugar content of that on the girdled branches was found to be considerably greater than that on the ungirdled branches; this increase, however, is only remarkable when the operation has effected a considerable hastening of maturity. Girdling is most effective on the American varieties.

719. KELLEY, V. W. 634.8-1.542  
**Grape pruning in Illinois.**  
*Circ. Ill. agric. Exp. Sta.* **468**, 1937, pp. 16.

Direction for pruning grapes in Illinois for growing on the Kniffin trellis system. The recommendations made are based on experimental work by Dr. A. S. Colby, Illinois, and favour moderate annual pruning, though it is thought that more unproductivity is due to too light than to too heavy pruning. Suggestions are made for determining, prior to pruning, the degree of severity most suitable to each individual vine, a procedure which leads to great increase in yield over a stereotyped treatment for the whole vineyard.

720. WITT, A. W. 634.51  
**A survey of the investigations on the propagation and testing of walnuts at the East Malling Research Station.**  
*Annu. Rep. East Malling Res. Sta. for 1937*, **A.21**, 1938, pp. 259-65.

The walnuts now collected at East Malling are all varieties of *Juglans regia* except three American varieties of *J. nigra*, one of which is valued for its timber while the other two produce nuts used in confectionery. Notes are given on the characters of some 4 French and 5 English varieties, which experience in England has shown to be good for English conditions, and of 2 varieties specially suitable for pickling. In addition some 40 other varieties are now being grown in duplicate at East Malling and their characters studied. Notes are given on methods of propagation and of ensuring pollination and a method of producing small garden trees is suggested.

721. KEMMER, E. 634.51-1.541 + 631.541.5  
Die Walnussveredlung. (**Grafting and budding the walnut.**)\*  
*Forschungsdienst*, 1938, Sonderheft 8, 387-9, bibl. 3.

As a result of trials which have been carried on with walnuts in Germany for some time, the author draws the following conclusions:—*Grafting in glasshouses*. The scion takes well on the seedling stock of the common walnut (*Juglans regia*). Bast may be used for binding grafted material. Waxing at the point of the grafts is entirely superfluous. All common methods of grafting result in a union between stock and scion. Whip-and-tongue grafting has certain advantages over other grafting methods. Grafting at the root-crown should be avoided. Grafts can be made at any other point, provided rootstock and scion correspond in size. Besides the late winter and spring months the period from mid-August to early-September is also suitable for grafting. Potting the rootstocks prior to grafting is entirely unnecessary, but after grafting, for which operation the stocks are lifted, the plants are bedded close together under glass. Potting which may be required in some cases, is carried out without difficulty after the union is completed and the scions have begun to grow. 959 grafts made during the trials gave 77% take. *Budding trials in the field*. Budding is carried out during the period June-August, when 1 and 2-year-old seedlings are chiefly used. Ring budding has proved the most successful, and is the method now employed. In order to facilitate ring budding special knives have been designed to reduce the danger of bark injury. Recently a simplified method of budding has been introduced, a form of patch budding in which the flap of bark on the stock is retained to cover the bud. The results of budding are still rather poor, being about 20% successful.

722. LOTT, R. V., AND ENZIE, J. V. 634.52  
**Some varietal leaf characters in the pecan.**  
*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, 35 : 86-7.  
COLBY, A. S.  
**Some results of selection in the northern pecan.**  
*Ibidem*, pp. 88-90, bibl. 2.

The leaf characters of the pecan offer a means of varietal identification. The differences apparent in the leaf characters of 5 common commercial varieties in New Mexico are described in the first paper.

In the second paper the author discusses some of the better northern pecan varieties which have come to light in Illinois.

723. STECKI, K. 634.55-1.547.6  
Dojrzewanie migdałów w Polsce. (**Ripening of almond trees in Poland.**)  
[German summary 14 lines.]  
*Ann. Sci. hort., Warsaw*, 1937, 4 : 1-5.

Ripe fruits were obtained from a 15-year-old almond tree (*Amygdalus communis* L. var. *fragilis* Ser.) growing at the University dendrological garden in Poznań, Poland. The tree was not covered against frost in winter.

#### PLANT PROTECTION OF DECIDUOUS FRUITS.

724. LENIN ACADEMY OF AGRICULTURAL SCIENCES, MOSCOW. 632.3/7 : 634.1/8  
**Summary of the scientific research work of the Institute of Plant Protection for the year 1936. II. Pests and diseases of industrial and fruit crops.** [Russian, English titles.]  
Leningrad, 1937, pp. 255-443, roubles 6.50.

The following subjects are dealt with somewhat briefly in this work. Pests and diseases of cotton pp. 256-94 ; of beets pp. 296-328 ; of clover and flax pp. 329-58 ; of hemp pp. 359-75,

\* See also Kemmer, E. (Institut für bstbau), "Die Walnussveredlung." *Merhbl. Inst. Obstb. Berlin*, 5, 1936, H.A., 7, 314.



and of fruit trees pp. 376-439. The last section mainly concerns pests, which include leaf rollers *Cacoecia* sp. etc., *Carpocapsa pomonella*, San José scale, *Psylla mali*. Several articles are devoted to oil emulsions and the technique of spraying.

725. MINISTRY OF AGRICULTURE, LOND. 632.9 : 634.1/7

**The control of fruit pests and diseases in gardens and small orchards.**

*Adv. Leafh. Minist. Agric. Lond.* **114**, 1938, pp. 4.

General control measures and programmes for their application against pests and diseases of fruit are outlined.

726. HARVEY, R. B. 537.531 : 664.84/5 : 632.19

**The X-ray inspection of internal defects of fruit and vegetables.**

*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, **35** : 156-7.

Work on the possibility of determining internal defects of fruits and vegetables by X-ray examination is now being done in connexion with the Minnesota agricultural experiment station. In the brief notes given here the possibility is shown of determining hollow heart of potatoes, internal defects of apples such as bitter pit, core flush, etc., and of sorting out freezing injury, drying or granulation, puffiness and internal diseased conditions of citrus fruits not noticeable on the surface.

727. IMPERIAL FORESTRY INSTITUTE, OXFORD. 632.111

**Spring frosts.**

*Bull. For. Comm., Lond.*, 1937, pp. 132, bibl. 48.

This timely bulletin concerns the causes of and damage done by spring frosts in Great Britain, the latter chiefly as affecting afforestation. The important effect of topography on frost intensity, especially in regard to its influence on the flow of air, is explained as fully as present knowledge permits, but it is a fact that the degree of damage more often depends upon the stage of development of the buds at the time of the frost than upon local air currents. The bud growth, however, may be affected in its turn by aspect and degree of slope. Other often interacting factors are the relationship of slope to soil, conditions affecting the rate at which a young tree grows out of the frost zone, exposure to the morning sun and shelter from the wind. This brief summary but inadequately conveys the mass of information which has been accumulated within these pages.

728. TINGLEY, M. A. 632.111 : 634.11

**Case history of two winter injured Baldwins.**

*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, **35** : 135-7, bibl. 1.

Two Baldwin apple trees were kept under observation following a minimum winter temperature of  $-31^{\circ}$  F. at Durlham, New Hampshire, on 30 December, 1933. One of them, showing as little injury as any Baldwin in the orchard, carried normal foliage and showed bark injury only in one small area in the crotch. In October 1934 it remained normal except for the loss of leaves on a 3-foot length of one low main branch. In 1935 it bloomed and set heavily, the branch which had shown the leafless tip breaking off under weight of fruit. At the time of writing it was the only living Baldwin in the orchard. Another typical Baldwin tree considered average in its degree of injury showed very much severer injury. The leaves opened in the spring of 1934, but many remained small and turned brown at the tips. Two branches appeared to be nearly normal. The gradual decline and death are here described in detail. In June 1934 bark cracks appeared on the trunks and main branches. By October only one branch showed normal foliage. A year later the best main branch had broken off in a wind and the rest of the tree was heavily infected with wood rotting fungi. At the time of writing a two-foot stump was all that remained. Notes are given on wood growth of both these trees after the frost.

729. ROBERTS, R. H. 632.111 : 581.145.1  
**Blossom bud development and winter hardiness.**  
*Amer. J. Bot.*, 1937, **24** : 683-5, bibl. 2.

The degree of flower bud development at the beginning of winter in the case of 61 species of woody plants was found to be correlated with winter hardiness, the more advanced blossom being more susceptible to cold injury. The killing is more specifically related to the presence of vacuolated cells in the blossom tissue especially in the pedicel and receptacle regions. *Ulmus americana*, however, is an exception, its flower buds being very hardy although possessing appreciable numbers of vacuolated cells. In future investigations of the nature of winter hardiness of buds, this tree should be studied.

730. SMITH, W. W., AND POTTER, G. F. 632.111 : 581.084.1  
**A freezing apparatus in which change of temperature is automatically controlled.**  
*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, **35** : 151-5, bibl. 1.

This freezing apparatus for use in winter injury investigations is the same in principle as that described by Potter in 1920 in *Amer. J. Bot.*, **7** : 21, but is entirely new in mechanical design. Its design and working are here described with the help of diagrams.

731. STENE, A. E. 632.111 : 634.25-1.542  
**Pruning of winter injured peach trees.**  
*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, **35** : 147-50.

In the very severe winter of 1933-4 peach trees in a small experimental orchard in Rhode Island suffered considerable wood as well as fruit bud injury. One row was given the ordinary spring pruning and the rest were left until well leafed out before pruning. The observations made corroborate previous evidence in peach areas that where weather and other conditions have favoured the proper maturing of normal well-grown trees there is relatively little danger of serious cambial injury to the trunk or bases of main limbs as compared with killing back of peripheral branches. When faced with the common type of winter injury, namely fruit bud killing and freezing back of terminals, it is safe to prune at the usual time and to the extent desired to remove dead wood and to shape the tree properly.

732. LATIMER, L. P., AND RAWLINGS, C. O. 632.111 : 634.11  
**The occurrence of seedless apples as a result of frost.**  
*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, **35** : 111-5, bibl. 6.

The incidence of frost on 21 and 22 May, 1936, caused damage to apple blossoms of McIntosh and Wealthy apple varieties in certain New Hampshire orchards. At New Boston affected McIntosh trees set little fruit, whereas trees which escaped the frost set their fruit well. In Wealthy, on the other hand, a fair set of fruit took place on some of the affected trees, the fruit being, however, seedless. A considerable number of these fruits developed to maturity, being then well formed but exceptionally large. They were rather low in colour and a considerable number of them had mouldy cores, but were perfectly marketable. It would appear that the embryos of the seedless apples were killed by the frost occurring 3 days after petal fall and that microscopical observations of flower parts immediately following frost cannot always be relied on as a basis for forecasting the crop of this variety.

733. REED, H. S. 632.19 : 576.3  
**Cytology of leaves affected with little-leaf.**  
*Amer. J. Bot.*, 1938, **25** : 174-86.

The changes in the cells of leaves affected with little-leaf are discussed following observations on a number of different species. These are briefly :—A promotion of cell growth rather than cell multiplication in the parenchyma, and a lack of differentiation ; destruction of chloroplasts and

an inhibition of their development ; profound alterations in the tannins causing them to remain in the affected leaves when they have disappeared from healthy ones ; characteristic derangements of the fibrovascular system of the leaf, though its elements show in their microscopical structure less disorganization than the cells of the palisade and mesophyll layers. The cause of the derangement of affected leaves is evidently associated with metabolism rather than with conduction.

734. BURREL, A. B. 634.11-2.19 : 546.27

**Control of internal cork of apple with boron.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 169-75, bibl. 12.*

Experiments in an orchard of 27-year-old Fameuse apple trees growing in a fine sandy loam soil in the Champlain Valley, New York State, are discussed and results summarized as follows :—  
“ Injection of boric acid, and soil application of borax both reduced the amount of internal cork by over 99% in the only orchard where symptoms were general this year. Limited studies in other blocks are corroborative. There was insufficient disease in non-treated checks to let us evaluate the spray method applying boron. No foliage injury has yet resulted from conservative soil applications or injection with proper precautions. Injury to apple foliage from excessive soil applications of boron appears to have distinctive characteristics which are described and pictured. Injury to apple foliage from borax in sprays was lessened or eliminated by the presence of lime or lime sulfur. Developing leaves appeared more susceptible to this injury than mature ones. Injury to apple bark around the injection hole appeared more severe when injection was performed about 1 September than when performed in late May. Since the injection method resulted in serious injury to the tree and since soil applications of boron were equally effective in controlling internal cork, it is recommended that the injection method should not be used commercially.”

735. DEGMAZ, E. S., BATJER, L. P., REGEIMBAL, L. O., AND MAGNESS, J. R.

634.11-2.19 : 546.27

**Further investigations on the use of boron for control of internal cork of apples.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 165-8, bibl. 3.*

Results of trials of the effect of boron in controlling internal cork of Ben Davis apples in the Shenandoah-Potomac fruit district of Maryland confirms the conclusions reached by Magness, Atkinson and others that internal cork is caused directly or indirectly by a deficiency of boron in the soil and can be completely corrected by the application of either borax or boric acid to the soil. Recommendations made for this particular district are the application of 1 lb. borax or  $\frac{2}{3}$  lb. boric acid per mature affected apple tree under the spread of the branches in late autumn or early spring. This should, in the absence of knowledge as to boron tolerance of the trees, not be repeated until cork reappears in the orchard.

736. SMOCK, R. M., AND VAN DOREN, A.

634.11-2.19

**The histology of bitter pit in apples.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 176-9, bibl. 5.*

A brief study is made of the anatomical characteristics of bitter pit in apples and the observations made are compared with those of workers elsewhere. The authors were unable to find any difference between tree pit and storage pit and consider that storage pitting is merely a later appearance of pitting in predisposed fruits.

737. SMITH, J. H.

632.8

**Some recent developments in virus research.**

*Ann. appl. Biol., 1938, 25 : 227-43.*

In this, the address of the retiring President of the Association of Applied Biologists, the recent developments in virus research as regards plant diseases are briefly noted.



738. BEST, R. J. 632.8  
**The chemistry of some plant viruses.**

Reprinted from *Aust. chem. Inst. J. Proc.*, 1937, 4: 375-92, bibl. 33.

It is suggested that there is no sharp break between living and non-living matter, and that viruses may be regarded as complex chemical structures, built on a protein base with a large number and variety of prosthetic groups, through which they enter into those reactions by which they become evident and by which they multiply—reactions which are generally associated with life and living. If this view be accepted then viruses may be considered as living molecules of graded complexity of structure and organization covering the transition between the architecture of the larger non-living chemical molecules and the architecture of the simplest living cell. [From author's summary.]

739. KAUSCHE, G. A. 632.8  
**Über die Trennung von Virusgemischen auf Grund der unterschiedlichen Säuren-Basenempfindlichkeit ihrer Komponenten. (Separating out individual viruses from virus mixtures by their different reactions to acidity and alkalinity.)**  
*Angew. Bot.*, 1938, 20: 246-56, bibl. 9.

Tobacco mosaic virus was isolated from a virus mixture present in tobacco plants, soil-infected from Sharpe's Express potatoes.

740. HARRIS, R. V. 634.75-2.8  
**A bibliographical note on the distinction between mild and severe strawberry crinkle.**

*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 201-2, bibl. 5.

Notes are given on the mild and severe form of crinkle as observed by Harris, Ogilvie, Zeller and other workers.

741. WORMALD, H., AND GARNER, R. J. 634.22-2.314  
**Manurial trial on nursery trees with reference to effect on plum bacterial canker.**  
*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 194-7, bibl. 4.

Randomized plots of young plum trees received various manurial treatments. They were then inoculated with *Pseudomonas mors-prunorum* and the size of the resulting cankers was noted. No significant differences were found in the results obtained, though there is a suggestion that applications of lime tend to induce susceptibility.

742. WORMALD, H. 632.314: 634.22  
**Two ornamental shrubs as hosts of the organism causing plum bacterial canker.**  
*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 198-201.

Bacterial lesions were found and *Pseudomonas mors-prunorum* was isolated from the lesions on a young almond (*Prunus Amygdalus*) in Berkshire and on a purple-leaved plum (*Prunus Pissardi*) in Kent.

743. HARRIS, R. V., AND PEARSE, H. L. 632.314: 634.1/2: 577.15.04  
**The crown gall disease of nursery stocks. III. A progress report on experiments from 1929 to 1937 to determine the relative susceptibility of Malling apple stocks and including the production of galls by synthetic growth substances.**  
*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 187-93, bibl. 8.

No. II apple stock proved most susceptible to galls following artificial infection with *B. tumefaciens*, being closely followed in this susceptibility by No. VII. No. I was comparatively resistant and No. XVI highly resistant. Galls were generally formed more readily when inoculation was made after the dormant period. The inoculations had a measurable, stimulating effect on the growth of the trees of each type of rootstock, irrespective of whether galls were formed or not. Inoculation with 2% indolebutyric acid in lanolin caused galls irrespective of variety of rootstock and time of inoculation. These galls were large and externally closely

resembled crown galls. Inoculation with the growth substance did not affect growth of trees of rootstocks No. VII and No. XVI, but they caused a significant depression in the growth of trees of No. II.

744. KADOW, K. J., AND ANDERSON, H. W. 632.41 : 631.531.17

**Damping-off control ; an evaluation of seed and soil treatments.**

*Bull. Univ. Ill. agric. Exp. Sta.* **439**, 1937, pp. 348, bibl. 116.

An illustrated and tabulated report on the control of damping-off. Correlations between certain variables (temperature, humidity, soil moisture, soil type and soil acidity) and several serious outbreaks of damping-off in the Chicago and East St. Louis areas were observed during the growing season of 1932. The effects of the different variables on the different fungus species in Illinois were then studied under greenhouse and field conditions during the period 1933-6. 80% of the damping-off cases were found to be caused by *Pythium* species, 15% by *Rhizoctonia* species, *Botrytis* and *Fusarium* spp. being only occasionally injurious. The pre-emergence phase of the disease causes more serious damage than the post-emergence phase. The pre-emergence stage was most influenced by soil moisture and temperature, while high humidity and light temperature were the chief factors in the post-emergence phase. Soil type and acidity were apparently unimportant to either phase. It seemed obvious, though data are not available, that the inter-relations of soil organisms have a great deal to do with the incidence of damping-off. It is recommended that certain cultural practices, which ensure the maintenance of good aeration and low humidity, should be supplemented by seed and/or soil treatment, the latter, however, being impracticable out of doors. Lists of seed treatments for different crops are given and treatment is recommended as a cheap insurance whatever the probability of an outbreak. The seed treatments consist in soaking the seeds, according to variety, in solutions of either cuprous oxide, copper sulphate, Semesan or zinc oxide, proprietary preparations being usually available and preferable. Soil treatment under glass consists in steam sterilization or disinfection with formaldehyde, but if treatment of seed is practised the added trouble and expense are scarcely justified. The useful list of references should be noted.

745. SIEMASZKO, W. 632.48 : 634.11

Brudna plamistość jabłek powodowana przez grzyb *Gloeodes pomigena* (Schw.) Colby. (**Sooty blotch of apples caused by *Gloeodes pomigena* (Schw.) Colby.**) [English summary 14 lines.]

*Ann. Sci. hort., Warsaw*, 1937, **4** : 57-63, bibl. 10.

Polish grown apples from several varieties marketed in Warsaw were found to be affected by sooty blotch (*Gloeodes pomigena*). Notes are given of the morphological character of the fungus observed, as also of *Leptothyrium Pomi* which was occasionally found in association with it.

746. STOLL, K. 634.11-2.42

Der Apfelmehltau (*Podosphaera leucotricha* [Ell. and Ev.] Salm.). (**Apple mildew.**)

*Forschungsdienst*, 1938, **5** : 513-22, bibl. 64.

The more important literature on apple mildew (*Podosphaera leucotricha*) is reviewed. The long list of references should prove useful.

747. WILSON, E. E. 632.48 : 634.2

**The shot-hole disease of stone-fruit trees.**

*Bull. Calif. agric. Exp. Sta.* **608**, 1937, pp. 40, bibl. 34.

A description of the shot-hole disease (*Coryneum Beijerinckii* Oud.) occurring on peach, almond and apricot. The disease was found to vary considerably in its severity on twigs, dormant buds, leaves, blossoms and fruit. The importance of the disease on the various organs in relation to control procedure is described. The known hosts of the fungus are peach, apricot, nectarine, almond, European plum, cherry-laurel, several species of wild and cultivated cherry, and *Prunus Davidiana*. In California peach, nectarine, almond and apricot suffer consistent losses from this disease. A brief illustrated description of the fungus is given. In California the fungus

is required to survive weather conditions in summer which do not favour its development. It does so on peaches as mycelium in the tissues of diseased twigs and buds. Conidia produced within the blighted buds seem to be able to survive the hot and dry summers in California and are thus instrumental in carrying the fungus from one season to the next. In apricots, the holdover sources of the fungus are the blighted dormant buds, lesions on twigs being rare, while in almonds it survives as mycelium in twig lesions, as mycelium and spores in blighted dormant buds, and to some extent as mycelium and spores in blighted blossoms that remain on the tree from year to year. Lesions on almond twigs are considered not so important as blighted buds in carrying the fungus from one season to the next. Rain is regarded as an important factor in the spread of the disease. Data indicate that the length of time between the entry of the fungus into the host tissue and appearance of symptoms is 5-8 days in leaves and 7-20 days in twigs. Variation in temperature is stated to cause differences in the length of this period. The influence of climatic conditions on the development of the disease was studied. In two trials leaf infection did not occur, unless the leaves were kept moist for at least 24 hours after inoculation. The relation of rainy periods to infection of peach and almond foliage is discussed. The following conclusions are reached from spraying tests made on almonds and peaches :—*Almonds*. Successful prevention of twig infection was not accompanied by a corresponding reduction of leaf infection, and, on the other hand, the application of bordeaux mixture, which gave the best control of leaf infection (January treatment), was too late for twig-infection control. From this the author concludes, that in almonds twig lesions, which were comparatively sparse, were not the major source whence spores spread to leaves. The most important sources appeared to be blighted dormant buds and diseased blossom parts. Spray applications that prevented the disease from developing on these parts gave the best control of leaf infection. *Peaches*. The sprays that most effectively prevented twig infection also gave the greatest control of leaf infection. This fact is interpreted to mean that in peaches spores causing leaf infection come primarily from twig lesions. The weather-resisting quality of sprays was studied, and it was found that the amount of copper remaining after several weeks of weathering on the twigs sprayed with different materials bore a direct relation to efficiency in controlling twig infection. Hence, the earlier the application, the greater was the amount of copper lost through weathering and the poorer the control.

748. MASSEE, A. M. 632.7 : 634.1/7

**Notes on some interesting insects observed on fruit trees in 1937.**

*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 203-8.

The author deals briefly with the incidence of a number of insects on fruit in 1937, amongst which the following are perhaps the most important :—the hop root weevil (*Epipolaeus caliginosus* F.), the codling moth (*Cydia pomonella* L.), tortrix larvae infesting stored apples (*Cacoecia podana* Scop.), and the apple leaf skeletonizer (*Anthophila pariana* Clerck.).

749. HODSON, W. E. H. 634.75-2.651.3

**The stem and bulb eelworm, *Anguillulina dipsaci* Kuhn, in strawberry in Britain.**

*Ann. appl. Biol.*, 1938, 25 : 406-10, bibl. 7.

The paper records the occurrence of *Anguillulina dipsaci* on strawberries in Britain, symptoms of attack are described and control measures suggested. It is unlikely that the hot-water treatment will free the plants from infestation, and it would appear best on infested land to substitute some other crop for a few seasons, nearing in mind that clover and narcissus are also host plants of this nematode.

750. BOVEY, P. 634.11-2.78

**La teigne des pommes (*Argyresthia conjugella* Zell.). (Apple fruit miner.)**

Reprinted from *Rev. hort. suisse*, 1937, Nos. 4 and 5, pp. 8, bibl. in the text.

This is an illustrated description of the apple fruit miner. Notes on the geographical distribution and biology of this insect are given, and damage and control measures are discussed.



751. STEINEGGER, P. 634.836.72 : 634.835.094  
 Die Reblausverseuchung in der Nordwestschweiz und die Direktträger-Frage.  
 (Phylloxera on vines in North-West Switzerland and the question of direct  
 producers.)  
*Schweiz. Z. Obst- u. Weinb.*, 1937, 47 : 161-6, 181-90, and 211-4.

The literature on phylloxera is reviewed and the life history of the pest is discussed. A description is given of the control measures taken in 1937, when a new strain was found to be attacking vines in North-West Switzerland. Many direct producers were found to be so severely infested that they were almost killed, others looked so strong and healthy that the presence of phylloxera could not be noticed until a thorough examination revealed that they were also infested. Infestation was most severe in the healthiest green plants, a fact which makes the discovery of the pest on vines more difficult. The chief danger of direct producers is that they are carriers of the very dangerous (above ground) phylloxera stage. For the development of this stage, however, the following conditions are necessary :—(i) mild weather conditions between the late summer and spring which do not result in the destruction of the winged population, their progeny or winter eggs ; and (ii) a supply of leaves of American vines or direct producers to support the phylloxera stage which develops from the winter eggs. There are indications from the results achieved in parts of Germany by the prohibition of such hybrids that a certain amount of control might well be achieved by the enactment and enforcement of similar prohibition ordinances in Switzerland.

752. MASSEE, A. M., GREENSLADE, R. M., AND DUARTE, A. J. 632.753 : 634.75  
 Notes on the strawberry aphid (*Capitophorus fragariae*\* Theob.).  
*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 209-12.

Notes are given on the life history of the strawberry aphid, which is known to be a vector of the yellow edge and mild crinkle viruses of strawberry. It is found that the aphid can live all the year on the strawberry but that it will, under certain conditions, breed quite readily on silver weed (*Potentilla Anserina* L.). Two winged periods were noted in Kent in 1937. The apterous viviparous females as well as the winged forms migrate readily.

753. COSTANTINO, G. 632.76 : 634.8  
 Un insetto dannoso alla vite : il *Labidostomis taxicornis* Fabricius. (A vine  
 pest, *Labidostomis taxicornis* Fabricius.)  
*Boll. Staz. Agrum. Frutt. Acireale*, 67, 1937, pp. 4, bibl. 11.

A description is given of the beetle *Labidostomis taxicornis* with an account of the geographical distribution of the insect and its host plants. The damage caused by this pest and control measures are described. The latter consist of spraying vines with lead arsenate and hand picking the insects.

754. COSTANTINO, G. 632.76 : 634.574  
 Il foratore delle gemme o "scaravagghiedda" del pistacchio (*Chaetoptelius  
 vestitus* (Muls. e Rey) Fuchs.) (The pistache bud borer.)  
*Boll. Staz. Agrum. Frutt. Acireale*, 65, 1937, pp. 14.

The cutting off and burning of infested branches at the end of March is recommended for the control of *Chaetoptelius vestitus* (Muls. & Rey) Fuchs.

755. MASSEE, A. M., GREENSLADE, R. M., AND DUARTE, A. J. 634.11-2.768 + 2.78  
 Studies of impregnated tree banding materials. IV.† Apple blossom weevil  
 and codling moth experiments.

*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 213-8, bibl. 1.  
 Work in 1937 was devoted to testing the effects of varying the weight of chemicals used for impregnating trapbands used against apple blossom weevil (*Anthonomus pomorum*) and codling

\* Known also as *C. fragaefolii* Kkll.

† For I-III see *Ibidem* for 1934, pp. 180-4 ; for 1935, pp. 177-83 ; for 1936, pp. 232-9, *H.A.* 5 : 230, 6 : 498 ; 7 : 654.

moth (*Cydia pomonella*). Corrugated cardboard bands were used containing various weights of 4 different chemicals, viz., 2 Seekay waxes, tetrachlorbenzene and beta-naphthol. One of the Seekay wax treatments attracted codling larvae, tetrachlorbenzene attracted weevils and beta-naphthol repelled weevils. Other treatments did not differ significantly from untreated bands. As regards weight of chemical used, in the case of *Anthonomus* the higher concentration of the two Seekay waxes, i.e. 20 oz. per 100 ft. of band, was the more attractive. There was no difference between the attractiveness of 10 oz. and 25 oz. of tetrachlorbenzene but 5 oz. was significantly more attractive. For dealing with codling larvae the lowest concentration of Seekay wax AX.111, i.e. 10 oz. per 100 ft., was significantly more attractive than either 15 or 20 oz. Differences in attractiveness of the different concentrations of the other treatments were not significant. 4-inch bands were found to catch considerably more weevils and larvae than 2-inch bands.

756. KEARNS, H. G. H., AND MARTIN, H. 632.793 : 634.22

**The control of plum sawfly (*Hoplocampa flava* L.).**

*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938, pp. 78-84, bibl. 6.*

The experiences gained in experiments carried out by the authors in the seasons 1934-1937 are here summarized. The pest was very effectively controlled by the application of one properly timed wash of highly refined petroleum oil emulsion and a rotenone-containing insecticide (*Derris* or *Lonchocarpus* root). The oil emulsion was more efficient as a spreader than a water-soluble wetter. An extract of *Lonchocarpus Nicou* gave a more potent combined wash than the powdered root.

757. STEER, W., AND HASSAN, A. A. G. 632.793 : 634.22

**Experiments in the control of plum sawfly on Czar plums.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 223-8, bibl. 6.*

In field spraying trials on the control of plum sawfly (*Hoplocampa flava* L.) on Czar plums, one spraying with derris gave substantially as good a result as two sprayings. Derris at 0.2% (equivalent to a crystalline rotenone content of 0.004%) gave, in conjunction with soap, an adequate measure of control, if applied at any time during the 7 to 10 days following petal-fall, differences in the date of application within this period having very little effect on the result. An unusually low concentration of derris (equivalent to about 0.002% crystalline rotenone) gave very promising results. Nicotine, at 0.05%, and lead arsenate paste, at 0.4%, were each ineffective whilst a preparation of thiodiphenylamine, at 0.1%, was only partially successful. [Authors' summary.]

758. THIEM, H. 634.22-2.793

**Versuche zur Bekämpfung der Pflaumensägewespen mit quassiahaltigen Fertigpräparaten. (Trials on the control of *Hoplocampa minuta* Christ. and *H. flava* L. on plum trees with quassia sprays.)**

*Forschungsdienst, 1938, 5 : 553-67, bibl. 6.*

As a result of identical trials carried out in various localities in Germany for the control of sawfly (*Hoplocampa* spp.) by spraying with quassia, both home-made and commercial, the best results were obtained with early or late-early varieties of plums by giving a post-blossom spray up to 8 days after petal fall, one thorough treatment being sufficient even under conditions of heavy infestation or unfavourable weather. Home-made and commercial preparations were equally effective, deterioration in the former always being traceable to the soap admixture.

759. ANDES, J. O. 632.952

**Plant-disease control by spraying.**

*Bull. Tenn. agric. Exp. Sta. 164, 1938, pp. 47, bibl. in text.*

Information, collected from various sources, is given on various kinds of sprayers and equipment used for the control of plant diseases in Tennessee. The advantages of stationary sprayers are pointed out. An account is given of field tests in which multiple-nozzle rods and high-pressure

pumps were found to be the most effective. The essentials of spraying, and the effect of local weather conditions on the size of equipment needed are discussed. The equipment should be of sufficient size to complete any one spraying in 3-4 days. Bordeaux mixture, lime-sulphur, and some elemental sulphurs are recommended as the best fungicides for general use. A number of other materials have also been found effective. Dusts were found useful as supplements under certain conditions, and in some cases as substitutes. Cold-pumped oil emulsion was satisfactory when power equipment was available for making it. Directions for preparation of spray materials are given. Special directions are given for spraying apples, peaches, plums, cherries, grapes, raspberries, potatoes and tobacco. Schedules are provided showing the susceptibility in Tennessee varieties to disease, spray-hardiness and adaptability to seasonal variation. Notes are given on the removal of spray residue from the fruits.

760. MACDANIELS, L. H., AND HILDEBRAND, E. M. 632.952 : 634.11 : 581.162.3  
**Results of further studies on the effect of bactericides on pollen germination and fruit set.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 14-23, bibl. 6.*

These investigations on the effects which the application to open blossoms of fungicides and bactericides has on set of apple fruits, have been in progress since 1929. The present report includes results obtained from 1934 to 1937 inclusive. On the basis of the data obtained the authors feel justified in assuming that from a practical standpoint it is possible to spray or dust apple trees in bloom with the various bactericides tried without seriously cutting down the set of fruit. This is particularly so with bordeaux 1-3-50 and the 20-80 copper-lime dust, which have been tested thoroughly under orchard conditions.

761. FAJANS, E., AND MARTIN, H. 632.95  
**The incorporation of direct with protective insecticides and fungicides. III. Factors affecting the retention and spray residue of emulsions and combined emulsion-suspensions.**

*J. Pomol., 1938, 16 : 14-38, bibl. 17.*

The authors describe the continuation of the work discussed in 1935 (*Ibidem*, 13 : 261-92, *H.A.*, 6 : 82) and in 1937 (*Ibidem*, 15 : 1-24, *H.A.*, 7 : 350) in which the laboratory evaluation of wetting agents and the effect of spray supplements on the retention and tenacity of protective deposits were respectively discussed. This work has now been extended so as to include emulsions and emulsion-suspensions. Refined petroleum or cotton seed oils were used and the emulsifiers compared were sulphite lye, sodium oleate, lime casein, Agral S.R. and dextrin. As in previous work, red cuprous oxide and cuprous iodide were used to examine the influence of solids on the emulsions. The surfaces used were paraffin wax, cellulose nitrate and a glyptal resin. The amount of emulsion retained was measured by a method previously described, but a new method was devised for determining the retention of free oil. A red dyestuff was dissolved in the oil and after application and appropriate washing to remove emulsified oil, the retained free oil was estimated colorimetrically. The addition of a wide range of finely divided solids to petroleum oil emulsified by means of several different agents shows that the removal of oil from the emulsion, with attendant flocculation of the solid, arises from the nature of the emulsifier rather than of the solid. Sulphite lye alone of the materials examined shows little or no reaction with the solid. Initial retention of the emulsion appears to be governed by the properties of the continuous phase. It is influenced (increased) by the addition of a solid if the latter is incompatible with the emulsifier and then to an extent proportionate to the degree of interaction. It is shown that the relative retention of free oil is not a function of the stability of the emulsions alone but is in part the result of specific properties of the emulsifiers. Retention of free oil varies inversely with the concentration of emulsifier and, in so far as added solids reduce the stability of the emulsion by reaction with the emulsifier, they increase the retention of free oil. Where interaction between the emulsifier and a solid occurs, giving rise to oil-flocculation of the solid, preferential retention of the solid follows. Tenacity of the solid is increased by the presence of oil but may be reduced by the emulsifier and one or other factor may predominate. A field



trial on potatoes yielded results generally in agreement with the laboratory findings. It is pointed out that under modern spraying conditions it is desirable that any spray fluid used should have a high degree of stability. Consequently emulsion-suspension systems in which considerable interaction occurs cannot be recommended. There are, however, special cases in which such mixtures might be of great value in securing a heavy deposit of oil-flocculated solid.\*  
H.S.

762. WEBER, A. L., McLEAN, H. C., DRIGGERS, B. F., AND O'NEILL, W. J. 634.11-2.95

**Influence of different materials on coverage and adhesiveness of sprays and their effect on residue removal from apples.**

*Bull. N. J. agric. Exp. Sta.* 627, 1937, pp. 16, bibl. 7.

In 1935 and 1936 "stickers" in various essentially identical spray combinations were tested at Glassboro, New Jersey, to determine their effect on the deposition and retention and ease of removal of spray residue. The most effective stickers were summer-oil emulsion, bentonite sulphur and milk, both as regards initial deposition of arsenic and greater retention of arsenic at the end of the 10-day weathering period. Application of pure bentonite resulted in the lowering of the deposition of spray and gave no greater retention in the check plot. The remaining agents showed little build-up or retention effect over the check plot. Both the total amount of precipitation for a given period and the amount of rainfall received at each rain was found to affect the retention of spray residues, e.g. with or without a sticking agent more residue will be removed by 1 rain of 2.20 inches than by 9 small rains totalling 2.49 inches. The efficiency of these different sticking agents on the fruit itself was very much the same as on the leaf. It is stated that analyses of the leaf not only suffice, but also largely remove the growth factor in investigations of this type. Marked differences were noted in the reaction of various stickers to sulphur and arsenic. Of the sticking agents tested, dry skim milk proved most effective in the deposition and retention of sulphur. No sticker treatment caused appreciable difficulty in the removal of lead and arsenic residues from the fruit at harvest time.

763. MARSHALL, J. 632.951 : 632.782  
**Inverted spray mixtures and their development with reference to codling moth control.**

*Bull. Wash. agric. Exp. Sta.* 350, 1937, pp. 88, bibl. 42.

The author presents an extended account of the development and use of the so-called inverted spray mixtures, especially summer petroleum oil-lead arsenate washes for codling moth control. A brief outline is given of the many attempts that have been made, particularly by the addition of spray auxiliaries, to increase the efficiency of lead arsenate sprays. While many of these modifications have been more or less beneficial, none has resulted in such marked improvement as has the introduction of "inverted" spray mixtures. These latter are defined as spray mixtures in which a suspended solid initially wetted by water becomes wetted by oil during the mixing or application of the wash. To promote such behaviour it is necessary to incorporate some substance to promote the oil-wetting of the solid. Oleic acid, various soaps and diglycol oleate function thus. It is suggested that in many cases the phenomenon may be due to the formation of oil-soluble or oil-wettable divalent and trivalent soaps. The possible mechanism of the inversion is discussed at length. The outstanding characteristics of these sprays are that the deposit is laid down in an even film and the amount of it increases with the length of time during which the mixture is applied, i.e. "build-up" of the deposit occurs. This results in greatly enhanced larvicidal efficiency but the ovicidal value of the oil is somewhat reduced, possibly because of its partial adsorption by the solid. The influence of impurities and of added substances, particularly zinc sulphate, upon the stability of the oil emulsions and upon the capacity for inversion of the spray mixtures is discussed. Low concentrations of zinc sulphate promote oil-flocculation of lead arsenate whereas higher concentrations stabilize the emulsion.

\* Marshall, J., *Bull. Wash. agric. Exp. Sta.* 350, 1937. *H.A.*, 8 : 763.

The mechanical treatment of the spray fluid also has an important bearing on its stability. Deposits of lead arsenate from inverted mixtures show a high degree of resistance to weathering and under arid conditions practically no loss occurs on this account. In the Wenatchee Valley no serious damage resulted from the application in May and June of four inverted lead arsenate-summer petroleum oil washes. Residue removal was complicated but not rendered unduly difficult. The author concludes that where codling moth infestation is very high this type of spray fluid is undoubtedly more efficient and at the same time cheaper than normal washes. Mention is also made of similar sprays incorporating calcium arsenate or zinc arsenite. The procedure for sampling the fruits and determining the arsenical deposit is described. H.S.

764. KEARNS, H. G. H., MARSH, R. W., AND MARTIN, H. 632.951/2  
**Combined washes. Progress report. IV. The phytocidal properties of petroleum oil sprays alone and in combination with lime-sulphur.**

*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938, pp. 65-77, bibl. 4.*

Preliminary field trials on apple varieties showed that acid and solvent refined petroleum oils of similar percentage of unsulphonated residue exhibited similar phytocidal properties. Extensive trials of a combined wash of a Grade G petroleum oil-sulphite lye emulsion, lime-sulphur and nicotine applied at petal fall of apples again demonstrated that the wash could be applied to all varieties not sensitive to sulphur without risk of foliage injury. The addition of the petroleum oil emulsion to a petal-fall lime-sulphur wash did not reduce the control of apple scab on the variety Worcester Pearmain. There was an indication that the oil emulsion may have reduced the number of apples picked. The petroleum oil emulsion applied to black currants at the tight cluster stage and to plums at the petal-fall stage caused a negligible amount of injury. [Authors' summary.]

765. MOORE, M. H. 634.11-2.42  
**Field trials in 1937 of the fungicidal and phytocidal properties of certain sprays used against apple scab. A progress report.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 229-35, bibl. 9.*

A number of weak sprays containing copper or sulphur were used on 10-year-old bush trees of Worcester Pearmain, Allington Pippin and Newton Wonder apple on No. IX stock. Notes are given of their efficacy against scab and of their effect on leaf burn and leaf drop, russetting, codling and sawfly.

766. FARRAR, M. D., AND ANDERSON, H. W. 631.811.7 : 635.655  
**A wettable sulfur with soybean flour.**

*Illinois St. hort. Soc. News Letter No. 2, 1938, pp. 1-2.*

Wettable ground sulphurs can be made by mixing 5 lb. soybean flour and 95 lb. of dusting sulphur. The mixture (which may be stored until required) should be placed in a bucket and enough water added to make a thick paste, otherwise it may ball and be difficult to wet. The paste with some added water is then placed in the spray tank. The cheaper non-wettable sulphurs thus treated produce a spray of easily suspended sulphur particles. The fungicidal action of this mixture will correspond to that of commercial wettable sulphurs that have a comparable sulphur particle size and sulphur content.

767. SHAW, H., AND STEER, W. 634.11-2.951.23  
**Spray residue investigations. II.\* The influence of spray supplements on the retention of lead arsenate on apples.**

*Annu. Rep. East Malling Res. Sta. for 1937, A.21, 1938, pp. 219-22, bibl. 7.*

In an investigation of the effect of spray supplements on the deposition and retention of lead arsenate, the amount of arsenical residue retained by the fruits was increased by a refined petroleum oil but not significantly affected by lime-sulphur, by Lethalate or by lime-sulphur and Lethalate. On leaves the effect was similar but less clearly defined because of inadequate sampling. [Authors' summary.]

\* For I see *Ibidem* for 1936, A.20, 1937, pp. 240-5, H.A., 7 : 672.

768. "VIRGINIA FRUIT."

632.95 : 634.1/7

**Common types of spray injuries.***Ill. St. hort. Soc. News Letter* No. 2, 1938, pp. 2.

Early sulphur spray injury is often apparent in the form of goosenecking and in the dwarfing of the leaves not so deformed. Visible injury later in the season often occurs as a scorching of the leaves usually in the centre. Lime-sulphur injures by depressing the photosynthetic activity of the leaves, and retards growth. Arsenical injury appears as a marginal burn. Copper injury takes the form of typical purplish red spots or flecks usually, though not necessarily, near the midrib. Intense injury causes yellowing and death of the more severely injured parts. Bordeaux mixture causes the leaves to lose moisture more rapidly than they do normally. This causes a drain on soil moisture with a consequent aggravation of drought-effects and a visible retardation of growth. The effect upon transpiration is less pronounced with insoluble proprietary coppers but they have their disadvantages which more than counterbalance this.

**VEGETABLES, STIMULANTS, OIL PLANTS.**

769. PRATASSENYA, R. Z.

576.312.35

**The obtaining of polyploid plants during regeneration.** [English summary  
1½ pp.]*Trud. Nikita St.—bot. Gdns., Yalta*, 1935, 19 : 1-20, bibl. 9.

The author describes a method of obtaining polyploids of geranium (*Pelargonium roseum*) and tobacco (*Nicotiana Tabacum*). Where geraniums were propagated by cutting off and planting the leaves and stalks, from 10% to 18% of the leaves and stalks planted gave rise to shoots with double sets of chromosomes. Where cuttings of *Nicotiana Tabacum* were planted they were found to develop a callus at the base from which shoots were obtained. Such callus was observed to be of double origin. In some cases it developed from the heart parenchyma, while in others it arose from the cambial ring of cellular-fibrous bunches. By forcing shoots from the lower callus in the sterile hybrid *F<sub>1</sub> Nicotiana rustica* (Erbasanta) × *Nicotiana Tabacum* (varieties Dubic Nikitski 44, Dubec Gaspra and American), 1% of the shoots contained double sets of chromosomes. The polyploid plants differed from normal plants in having a stronger pubescence, thicker leaves and larger blooms. Such plants were fertile whereas those from which they arose were sterile. A study of the reduction division of *N. rustica* × *N. Tabacum* showed that heterotype and homotype divisions proceeded correctly. Inspection of the pollen showed that up to 40% was abortive. When selfed, these plants developed capsules well and produced viable seeds. Capsules also developed well after pollination with the parent forms (*N. Tabacum* and *N. rustica*). Plants with double sets of chromosomes were found to possess increased oxydizing regenerative energy. Amphidiploid *N. rustica* × *N. Tabacum* contained 3.46% of nicotine while the form from which it originated contained only 2.6%. *Ocimum canum*, *Ocimum gratissimum*, *Cynanchum acutum*, *Prunus Cerasus*, *Nicotiana Tabacum* and various hybrids of the species *Nicotiana* and *Atropa Paschkevicz* were found to root well and develop callus when treated in the same way as geranium and it is hoped to obtain polyploids from these.

770. OGILVIE, L., AND HICKMAN, C. J.

635.1/7-2.3/4

**Progress report on vegetable diseases. IX.***Annu. Rep. Long Ashton Res. Sta. for 1937*, 1938, pp. 96-109, bibl. 7.

A summary of work on vegetable diseases in the Bristol province in 1936-37 includes notes on the following:—*Asparagus* rust; dwarf beans:—halo blight (*Bacterium Medicaginis* var. *phaseolicola*), mosaic and anthracnose (*Colletotrichum Lindemuthianum*); runner beans:—*Sclerotinia* disease; lettuce:—*Botrytis* disease in the open and under glass; onions:—white rot (*Sclerotium cepivorum*), and onion smut.



771. MINISTRY OF AGRICULTURE, LOND. 633.491-2.8

**Virus diseases of potatoes, mosaic, crinkle and leaf-drop streak.**

*Adv. Leaflet. Minist. Agric. Lond.* **139**, 1938, pp. 6.

Three of the four potato diseases of common occurrence in England and Wales are discussed and illustrated. Leaf-roll disease is dealt with in Advisory Leaflet No. 278.

772. JOHNSON, J. 633.71-2.314

**Relation of water-soaked tissues to infection by *Bacterium angulatum* and *Bacterium tabacum* and other organisms.**

*J. agric. Res.*, 1937, **55** : 599-618, bibl. 10.

When the intercellular spaces of tobacco and other plant species selected at random from garden and greenhouse were water-soaked after inoculation with *Bacterium angulatum* and other organisms, it was found that tobacco, which is normally resistant to infection with *Bacterium angulatum*, became very susceptible to the organism and that no other set of environmental conditions for infection brought about the "epidemic" type of this disease. Of the other species some became susceptible after water-soaking while others remained unaffected.

773. CLAYTON, E. E. 633.71-2.314

**Water soaking of leaves in relation to development of the blackfire disease of tobacco.**

*J. agric. Res.*, 1937, **55** : 883-90.

Experiments show that tobacco leaves are readily infected by *Bacterium angulatum*, if their resistance to invasion has been broken down by water soaking. Resistance of the leaves to water soaking and hence to the disease, was found to be greatly modified by topping and manuring practices. In order to increase leaf resistance to water soaking in the flue-cured tobacco areas high topping and low nitrogen and high potash manuring are recommended.

774. BEATTIE, J. H. 635.262

**Production of garlic.**

*Leaflet. U.S. Dep. Agric.* **138**, 1937, pp. 5.

The main points in the cultivation of garlic are discussed, notes being given on soils, fertilizers, the choice of varieties, insect pests, sprouting, harvesting, grading, storing, marketing and shipping.

775. LEWIS, A. H. 631.84 : 635.36

**The relative values of organic and inorganic nitrogen fertilizers.**

*Emp. J. exp. Agric.*, 1938, **6** : 38-52, bibl. 8.

The experiments were carried out by the Imperial Chemical Industries at Datchet with brussels sprouts on typical alluvial market-garden soil. It is shown that organic nitrogen fertilizers (not bulky organic materials of low analysis such as farm-yard manure) are not superior to inorganic nitrogen fertilizers in crop producing power nor is there any evidence that they have any value beyond that due to their nitrogen content. Provided the lime status of the soil is maintained at an adequate level, inorganic nitrogen fertilizers will give at least as good results as organic nitrogen fertilizers supplying the same amounts of nitrogen.

776. HASEMAN, L. 632.7 : 635.61/63

**Controlling insect pests of melons, cucumbers and related crops.**

*Bull. Mo. agric. Exp. Sta.* **391**, 1937, pp. 19.

The life history, nature and extent of damage of and control measures against the most important insect pests attacking melons, cucumbers and related crops are discussed.

777. BATRAKOV, M. A. 635.64  
**Trials with tomatoes.** [Russian.]  
*Fruits and Vegetables, Moscow, 1938, No. 5, p. 53.*

In 1937 two trials were made by the author :—(1) A comparative trial of training tomatoes on the one-stem and two-stem form ; (2) the production of tomatoes from heterotic seeds. 160 plants were used in each trial. The following conclusions were reached :—Tomatoes trained in the two-stem form produced higher yields and gave a higher percentage of early fruits. On the other hand those trained in the one-stem form produced larger fruits. In the 2nd trial seeds from the cross Sparks×Fikarazzi and its reverse were used, and the results were compared with those of parental forms. Both parental forms were found to yield less and to bear fewer early ripening fruits. The size of the fruit from the hybrids, however, was smaller and the flavour was not so good as that of Sparks.

778. MAPPES, F. 635.64 : 632.19 : 631.8  
 Ein Nährstoffmangelversuch mit steigenden Stickstoff-, Phosphorsäure- und Kaligaben zu Tomaten in zwei Erziehungsformen, 1936. (**Nutrient deficiency trials with increased application of nitrogen, phosphoric acid and potassium to one- and three-shoot forms of tomatoes, 1936.**)  
*Obst. u. Gemüseb., 1938, 84 : 51-2.*

From data obtained in 1936 in field trials on tomatoes (Stonor) at the Agricultural Research Station Limburgerhof (I.G.F.), on sandy loam, the following conclusions are reached :—Of the fertilizers applied only nitrogen gave a definite increase in yield. PK plots produced only slightly higher yields than control plots. An increased application of N from 80 to 120 kg. per ha. did not increase yields of one-shoot tomatoes, but a considerable increase was obtained in the three-shoot tomato plots. An increased application of P and K also gave higher yields on three-shoot but not on one-shoot plots. Nitrogen produced generally a somewhat (9%) higher yield on three-shoot plots than on one-shoot plots. The one-shoot tomato is, however, still considered a better market proposition, as its fruit matures earlier than that of the three-shoot tomato.

779. LLOYD, J. W., AND WEAVER, B. L. 635.64 : 631.8  
**Fertilizer experiments with greenhouse tomatoes.**  
*Bull. Ill. agric. Exp. Sta. 438, 1937, pp. 275-87, bibl. 12.*

In 1930 fertilizer trials were started at the Illinois Experiment Station, in which the effect of N and P was studied on greenhouse tomatoes, grown in ground beds of dark prairie soil. The fertilizers were applied at different stages of growth, and were supplementary to a basic treatment of manure and phosphorus. The results are tabulated and show that both N and P, or treatments with both fertilizers combined were detrimental rather than beneficial. Where ample supplies of manure are available the autumn crop of greenhouse tomatoes, and probably the spring crop also, may advantageously be grown under the conditions obtaining, without the addition of artificial fertilizers.

780. BOROWICZ-KĘPKOWA, A. 635.64 : 631.542  
 Wpływ ogławiania w porównaniu z usuwaniem górnych kwiatostanów na wzrost i owocowanie pomidorów. (**Comparison of heading and disbudding on growth and fruiting of tomatoes.**) [English summary 1 p.]  
*Ann. Sci. hort., Warsaw, 1937, 4 : 136-52, bibl. 10.*

The effect of heading and disbudding on the growth and fruiting of tomato plants was studied for 3 years at Skierniewice, Poland. The following notes are taken from the author's summary : 1. There was no significant difference between the height of stems of the control plants and plants which had the upper flower clusters removed. 2. The headed plants produced the highest yields of early fruits (harvested at the first three pickings at 5-day intervals), the next highest weights of early ripe fruit were given by the controls, while disbudded plants gave the lowest

yields. 3. The earliness of the headed plants was also shown in the smaller amount of green fruits harvested at the last picking. 4. The total yield of disbudded plants was significantly higher two years out of the three than that from the same number of clusters of headed plants mainly owing to there being fewer fruits on the flower clusters after heading. The controls gave yields similar to those of the disbudded plants. 5. Heading had a less depressing effect on total yield when 2-3 leaves were left above the highest flower cluster. 6. As compared with the controls, the size of fruits of the 3rd-5th cluster was greater where the higher clusters had been removed. 7. Disbudding was found to be more laborious and expensive than heading. The latter method has also the advantage of earlier fruiting.

781. SCHLÖSSER, L. A. 635.64 : 631.547.6  
Fruchtstandshöhe und Reifungsgeschwindigkeit bei Tomaten. (The position  
of fruit on the plant and its relation to early ripening in tomatoes.)  
*Züchter*, 1938, 10 : 132-6.

In 1937 trials were made with *Lycopersicum cerasiforme*, *L. racemigerum*, and *L. esculentum* at Kleinwanzleben, Germany. The experiments are described here in some detail. The following notes are taken from the summary :—The arrangement of fruits on the stems both of wild and cultivated tomato plants is said probably to depend on the presence of an allelomorphic series, the position on the stem being determined in each case by a pair of genes. "High" setting of the fruits was found almost entirely predominant over "low" setting. The lower the setting of fruits the earlier they ripened. Early ripening of the fruit is due to a low internodal position of the stem branches from which the fruit comes and not to the absolute height of the fruits above the ground. It is indicated that, in order to analyse the physiological development of the genes determining the setting of fruits on the stem, the ratio minerals: carbohydrates needs studying.

782. BRUSENTOV, N. V. 635.64 : 631.541 : 633.491  
Grafting experiments with various plants. [Russian.]  
*Fruits and Vegetables*, Moscow, 1938, No. 5, pp. 57.

King of the Earlies tomato grafted on Brusentsov's Serebryanka potato produced a highly disease-resistant plant, dwarf enough not to require tying.

783. AINSWORTH, G. C., OYLER, E., AND READ, W. H. 635.64 : 632.48  
Observations on the spotting of tomato fruits by *Botrytis cinerea* Pers.  
*Ann. appl. Biol.*, 1938, 25 : 308-21, bibl. 6.

The spotting of tomatoes under both field and glasshouse conditions by *Botrytis cinerea* develops only under conditions of high humidity. With the return of drier conditions the germinated spores die, leaving the fruit marked. The *Botrytis* spots have until recently been ascribed to aphid injury; the two types of injury are here distinguished and illustrated. The control of *Botrytis* is a matter of employing sound horticultural practice, especially correct ventilation and the removal of all debris capable of harbouring the fungus.

784. SMALL, T. 632.411 : 633.491 + 635.64  
The relation between potato blight and tomato blight.  
*Ann. appl. Biol.*, 1938, 25 : 271-6, bibl. 2.

From experiments carried out in Jersey it was found that tomato plants for outdoor cropping are liable to contract blight (*Phytophthora infestans*) if raised in glasshouses in which diseased potatoes have been or are being grown. Early outdoor potatoes affected with blight are not really dangerous to neighbouring outdoor tomato crops. Diseased tomato crops, however, may be a serious menace to neighbouring potato crops. It is probable that more than one strain of *Phytophthora infestans* exists.



785. MINISTRY OF AGRICULTURE, LOND. (A. H. HOARE). 635.651  
**Beans.**

*Bull. Minist. Agric., Lond.*, 1936, **87**, pp. 69, bibl. 13, 2s.

- MINISTRY OF AGRICULTURE, LOND. (A. H. HOARE). 635.656  
**Green peas.**

*Bull. Minist. Agric., Lond.*, 1937, **81**, pp. 73, bibl. 23, 1s. 6d.

These publications provide an account of the cultivation of various types of culinary beans and of garden peas in the U.K.

786. OGILVIE, L., HICKMAN, C. J., AND WALTON, C. L. 632.651.3 : 635.656 : 631.8  
**The effect of fertilisers on peas affected with "pea sickness". Pot experiments.**

*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938*, pp. 118-26, bibl. 10.

Pot experiments were carried out on peas, variety Surprise, to determine the effects of fertilizers on plant growth and the eelworm population *Heterodera schachtii*, the soil used being heavily infested. Fertilizer treatments were given to steam sterilized and to unsterilized soil as follows : no manure, superphosphate and potash, nitrochalk and superphosphate, and nitrochalk, superphosphate and potash. None of the fertilizers affected the eelworm population. As in 1936 results indicated that eelworm interferes with the nitrogen metabolism of the plants. The addition of nitrogen enabled the plants to get normal supplies of this element and appears to be a practical method of getting normal crops from eelworm infested soil.

787. MURNEEK, A. E., AND GOMEZ, E. T. 612.014.44 : 635.655  
**Influence of length of day (photoperiod) on development of the soybean plant, var. Biloxi.\***

*Res. Bull. Mo. agric. Exp. Sta.* **242**, 1936, pp. 28, bibl. 12.

Conspicuous differences in the rate of growth, time of sexual reproduction, leaf colour and plant development in general, were noted in the soybean plants var. Biloxi exposed to 7 hour and 14 hour photoperiods at similar temperatures. The long day plants still remained vegetative with no sign of reduction in growth and initiation of reproductive organs on the 42nd day after germination when the short day plants were in bud and about to open their flowers.

788. CAYLEY, D. M. 635.8  
**Experimental spawn and mushroom culture. I., II.**

*Ann. appl. Biol.*, 1937, **24** : 311-20, bibl. 4, and 1938, **25** : 322-39, bibl. 27.

The first paper is a study of the habits of 3 wild species of mushroom as compared with several cultivated varieties in order to devise a method of bringing these better flavoured field varieties into cultivation. The author deplores the classification of all the cultivated forms and the wild field mushroom under *Psalliota campestris*. She considers the cultivated and wild forms to be separate species with marked differences in reaction and growth in culture. The second paper deals with possible methods and materials to be employed in making the composts in which the mushrooms are to be grown.

789. SCHEUNERT, A., AND RESCHKE, J. 635.1/5 : 577.16  
**Über den vitamin-C-Gehalt von Gemüsen, welche einerseits mit Stalldung, andererseits mit Stalldung + NPK gedüngt worden waren. (The vitamin-C-content in vegetables as affected by the use of fertilizers.)**

*Forschungsdienst*, 1938, **6** : 34-48.

Trials were made to determine the variation in vitamin-C-content of various vegetables according to whether they had received farm-yard manure or farm-yard manure plus NPK. As a result the authors concluded that no such difference in vitamin-C-content occurred as would be likely to affect the nutritive value of the vegetables. The actual differences found by titration corresponded with the physiological fluctuations which exist between the different plants and parts of plants.

\* See also 652.

790. JAENTSCH, W. 631.8 : 635.1/7  
Kalk, Humus und Handelsdünger bilden den Grundakkord bei der harmonischen Düngung unserer Gemüsekulturen. (**Lime, humus and commercial fertilizers are the basis of a well-balanced manuring in our kitchen gardens.**)  
*Obst. u. Gemüse.*, 1938, 84 : 71-2.

Beneficial effects of commercial fertilizers on various vegetable crops are said to depend both on humus present in the soil and its availability, which again depends on the amount of lime in the soil. Tables are given, of which the first shows in graphic form what lime conditions are favourable for certain vegetables. [The classification of lime content in the table in such terms as poor, small, moderate, saturated and rich is somewhat indefinite.—ED.] The second table shows the effect of lime content on chemical changes in the soil.

791. BEARD, F. H. 633.79  
**A review of hop investigations at East Malling.**

*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 161-5, bibl. 5.

*New varieties.* After initial selection at Wye, some 500 seedlings have been received at East Malling for testing and at present 300 are under trial there. The new varieties are tested for cropping, resin content, susceptibility to disease (especially downy mildew) and brewing. *Commercial varieties.* Attempts to sort out and differentiate the common commercial varieties have been greatly hindered by the presence of mosaic in the true Goldings and in Golding varieties, but are being continued. *Manuring.* Sand cultures made during 1927 and 1931 disclosed valuable diagnostic characters associated with the omission of certain essential elements (*J. Pomol.*, 1932, 10 : 91, *H.A.*, 2 : 264). Field trials indicated that dung was preferable to other organic forms of manure and that potash in any form was beneficial. *Cultural trials.* These have been carried out on the Fuggle, a variety immune to mosaic though probably a carrier, and have included tests of distance apart of hills and number of bines per string, reports on both of which have already been made (*Ibidem for 1936*, pp. 117-28, *H.A.*, 7 : 697). *Methods of cutting, pulling and stopping.* Preliminary trials with Tutsham indicate that stopping the bine during growth greatly affects head formation. *Pests and diseases.* A 1% lime-sulphur application in May or June has recently been found to give satisfactory control of red spider in the field. Investigations are in progress on possible insect vectors of mosaic, and on *Verticillium* wilt.

792. HARRIS, R. V., AND FURNEAUX, B. S. 632.48 : 633.79  
**Verticillium wilt of hops. A summary of information for growers.**

*Annu. Rep. East Malling Res. Sta. for 1937*, A.21, 1938, pp. 257-8.

Results of research on *Verticillium albo-atrum* from its identification in 1924 to the present are summarized and provisional control measures are enumerated.

793. MINISTERIE VAN ECONOMISCHE ZAKEN, HOLLAND. DIRECTIE VAN DEN LANDBOUW. 633.8

Rapport betreffende de teelt, den handel en de verwerking van geneeskrachtige, aromatische en aanverwante gewassen. (**Report on the cultivation, trade and processing of medicinal, aromatic and similar plants.**)

*Meded. Tuinbouw-voorlichtingsdienst*, 4, 1938, pp. 58, f. 0.30.

This is the report of a Government Commission set up in Holland to enquire into the possibilities of the development of a herb industry. Long lists of probably suitable plants are given and the directions are indicated in which research on the horticultural aspects of the question might profitably be undertaken. Marketing and the economics of the trade are discussed. Short cultural notes including propagation are given in a table of 134 varieties, and the part of the plant employed is mentioned, but not the uses to which it is put. The report concludes with a paper by the Chairman of the Committee, Dr. W. C. de Graaf, on the necessity for the standardization of medicinal herb products.

794. CARLBLOM, A. I. 633.85

**On the composition of the essential oil obtained from the flowering coriander.**

[Russian, English summary 14 lines.]

*Bull. appl. Bot., Leningr., ser. III*, No. 13, 1936, pp. 53-66, bibl. 18.

The composition of the essential oil of coriander collected during the flowering stage was determined and is here discussed at some length.

795. REILLY, J., AND KELLY, D. F. 633.85

**Oils from Irish grown plants.**

*Agric. Bull. Cork*, 4, 1937, pp. 92, bibl. in text, 2s. 6d.

A preliminary report on the possibility of producing fatty oil-bearing seeds in Ireland. It appears that a number of such crops are suited to the soil and climate. Information is given on the cultivation, yields and utilization of various oil-producing plants.

796. INSTITUTE OF PLANT INDUSTRY, LENINGRAD. 668.52 + 633.81

**Essential oil plants in U.S.S.R.** [Russian, with brief English summaries.]

*Trud. Nikita, St. bot. Gdns. Yalta*, 1936, 20 : 7-143.

Chemical analyses were made by the Institute of Plant Industry, U.S.S.R., of some 20 essential oil plants obtained from Central Asia, Azerbaijan and the Crimea. The studies, the results of which are given in an English summary for each plant under investigation, were carried on for 4 years.

797. STEGER, A., AND VAN LOON, J. 589.74 : 665.3

**The fatty oil from the seeds of *Valerianella olitoria* Poll.**

*J. Soc. chem. Ind.*, 1937, 56 : 298T-300T.

The oil of the seed kernels of corn salad (*Valerianella olitoria* Poll.) is analysed and is found likely to be of value as an edible oil or for use in the paint and varnish industries, especially in the manufacture of non-yellowing white paints and artists' colours. The extraction residue from the kernels might be used for manurial or cattle feed purposes. The oil and extraction residue from the husks is of no special use.

798. SCHROPP, W. 632.19 : 631.83 : 633.5 + 633.85

**Beiträge zur Kenntnis der Kalimangelerscheinungen bei einigen Öl- und Gespinstpflanzen. (A contribution to the knowledge of potash deficiency symptoms in some oil and fibre plants.)**

*Ernähr. Pfl.*, 1938, 34 : 165-70 and 181-6, bibl. 15.

Potash deficiency studies were made at the Institute of Agricultural Chemistry, Weihenstephan, with various oil and fibre plants. The observations were made on plants at different stages of growth and included water culture, pot and field trials. The following conclusions were reached : In colza and rape, potash deficiency manifested itself by a marked delay in shoot growth, poor leaf development, and a dark leaf colour. In poppy, potash deficiency became evident through a darkening of the leaf colour, followed by a delay in flowering and a check in the development of the plant. Potash deficient mustard plants developed thick, squat stalks, inward curling of the leaf margins and brown spots on the surface of the leaves. In the case of *Camelina sativa* and *Raphanus oleiferus*, inward curling of the leaf margins, dark leaf colouring and brown spots on the leaf surface were the signs of potash deficiency. In soya beans, potash deficiency manifested itself by dark colouration of young leaves, brown spots on the leaf surfaces and a tendency of the leaf margins to curl inwards. *Ricinus communis* plants were backward in growth, their leaves were small and discoloured and had a tendency to turn brown and for their leaf margins to curl inwards, when suffering from potash deficiency. Potash deficiency in flax caused a darkening of the colour of the leaves which subsequently turned brown. Such flax plants also tended to branch abnormally and to be late in flowering. Potash deficient hemp plants had leaves of a convex appearance, young leaves were abnormally dark in colour and the leaf margins



turned brown abnormally soon. Potash deficiency in jute manifested itself by the dark colouring of the leaves. Photographs and tables are given.

799. MINISTRY OF AGRICULTURE, LOND. 664.583  
**Crops for pickling.**

*Bull. Minist. Agric., Lond., 103, 1937, pp. 25, 9d.*

In this bulletin are discussed the methods of cultivation and subsequent treatment on the farm of the types of vegetables, etc., used in pickling and generally imported for the purpose. Such vegetables can, however, be produced in good quality in this country.

## FLOWER GROWING.

800. CALDWELL, J., AND JAMES, A. L. 635.944 : 632.8  
**An investigation into the "stripe" disease of narcissus. I. The nature and significance of the histological modifications following infection.**  
*Ann. appl. Biol., 1938, 25 : 244-53, bibl. 5.*

The histological bases of the various types of symptoms found with what is known as "stripe" of narcissus are described. It is shown that they are all produced by the same 3 factors acting with varying degrees of relative intensity. It is suggested that the disease is caused by a virus complex having at least 3 components. Inclusion bodies in the cells of diseased plants are described which resemble the x-bodies associated with some virus diseases. [From authors' summary.]

801. MCWHORTER, F. P. 635.944 : 632.8  
**The antithetic virus theory of tulip-breaking.**  
*Ann. appl. Biol., 1938, 25 : 254-69, bibl. 7.*

In this paper the hypothesis originally put forward by the author\* is proved that tulip breaking results from the interaction of two viruses one of which inhibits flower and leaf colour while the other adds flower colour but has no visible effect on chlorophyll distribution. The established commercial broken tulips contain physiologically balanced mixtures of these two viruses. When in the inoculation experiments unbalanced virus mixtures were used the induced colour patterns varied greatly in appearance. The term antithetic is suggested for naturally associated viruses which are physiologically antagonistic.

802. FIKRY, A. 635.939.516 : 632.452  
**Rust pustules on roots of antirrhinum.**  
*Ann. Bot., Lond., 1938, 2 : 536-7.*

Rust of antirrhinums (*Puccinia Antirrhini* Diet and Holw.) appeared for the first time in Egypt in 1936 and was very destructive. All above ground parts of the plant were attacked. On pulling up pot grown plants for examination teleuto sori were found on tap and lateral roots which had never been exposed to air and had always been covered by the soil. Rust attack on roots does not seem to have been previously recorded.

## CITRUS† AND SUB-TROPICALS.

803. HALL, W. J. 634.3  
**Citrus cultivation in Southern Rhodesia.**  
*Emp. J. exp. Agric., 1938, 6 : 101-11, bibl. 8.*

A short historical note of the introduction of citrus into Rhodesia is given followed by an account of the cultural methods in use. The remainder of the article concerns the research at the Mazoe

\* McWhorter, F. P., 1932. "A preliminary analysis of tulip breaking." *Phytopathology* (Abs.) 22 : 998.

† See also 631.

Citrus Experimental Station of which the author is Director. Stock-scion relationships are a principal line of investigation in view of some incompatibility between Mazoe rough lemon (the local stock), and the Jaffa and Premier scion varieties. In this connexion double working with a mutually compatible intermediate is under experiment. A limited number of superior trees have been selected as sources for the supply of scion wood. Investigations into manurial practice have resulted in considerable modifications and fertilizers are now given in the irrigation water, particular emphasis being laid on the value of correct seasonal application. On the local soils nitrogen and phosphorus increase yield and vigour, potash does not increase soluble solids, but increases acidity. The cause of an increasing number of unthrifty trees has been traced to boron deficiency. The manufacture of synthetic manure from vegetation and from the orange waste from the by-product factory now forms a routine estate operation. Fumigation for scale has produced an interesting problem in the occasional burning of the fruit while the leaves are unaffected; usually with fumigations involving cyanide the reverse is to be expected. While not so prevalent as in other citrus countries there are four or five diseases of regular occurrence. A memoir on these is in the press. Wastage in harvested fruit is not serious, owing probably to favourable climatic conditions. To reach the consumer the exported fruit has a long journey of from 20 to 33 days under not always favourable conditions which has led to a considerable amount of investigational work on the carrying qualities of fruit; the results have been published from time to time in the annual reports of the Mazoe Research Station. As a result of experimental work on the so-called artificial colouring of citrus most exporters have now adopted the practice. Much information concerning maturity tests taken at various times of the year on different varieties of citrus has been collected.

804. VLASENKO, I. A. 634.3  
**Citrus trees in the South of Ukraine.** [Russian, English summary 16 lines.]  
*Soviet Subtropics*, 1938, No. 4 (44), pp. 29-38.

As a result of trials, which are described in considerable detail, it is concluded that the climate of Southern Ukraine should be suitable for citrus cultivation in spite of low winter temperatures ( $-22^{\circ}\text{C}.$ ), provided that special measures of protection are taken. The method of planting citrus in trenches 1.5 m. deep  $\times$  1.5 m. wide was found to be simple and inexpensive and to give considerable protection.

805. RODIONENKO, G. 634.322 : 581.144.2  
**Mandarin Unshiu on the soils of the Ilyich State Farm.** [Russian, English summary 15 lines.]  
*Soviet Subtropics*, 1938, No. 2 (42), pp. 50-5.

In 1935-6 root studies were made of the mandarin-orange Unshiu on the principal soil types of the Ilyich State Farm in Abkhazia. The soil types were (1) subtropical podzol (heavy loam) with pH 5, (2) alluvial soil in the initial podzol farming stage with pH 5.75, and (3) yellow soil with pH 5.05. The root system of young plants on the first type of soils was found to be in a very poor condition. The roots were near the surface and were consequently affected by climatic conditions. The second type of soil provided excellent conditions for a good root development. On the third type of soil the root development was found to be adequate, although slightly inferior to that on alluvial soil. To improve the podzol soils heavy applications of humus in various forms, as well as liming and marling, are recommended. For the improvement of drainage, beds of semi-spherical form are suggested.

806. FILIPPENKO, I. A., HERBER, E. KH., AND ELPIDINA, O. K. 634.3 : 581.132  
**Photosynthesis in citrus trees.** [Russian, English summary 13 lines.]  
*Soviet Subtropics*, 1938, No. 4 (44), pp. 50-2.

In 1935 and 1936 studies were made of photosynthetic activity in citrus, tea, tung and *Cinchona* plants at the Batum Botanical Garden. Most of the citrus and other plants were found not to require direct sunlight in summer, since their maximum photosynthetic activity resulted from

light intensities ranging from 8,500 to 12,000 lux while light intensity during the summer months is 35,000 lux. This leads the authors to the conclusion that a much closer planting is possible, i.e. up to 1,000 trees per ha, provided that the environmental conditions, development and treatment of the plants are appropriate. Citrus trees did not pass through a "dormant period" in winter and were found to adapt themselves to a great extent to environmental conditions. In order to prevent starvation of citrus plants covered in winter as a precaution against freezing, they should be given at intervals the amount of light required for their maximum photosynthetic activity. Results are graphed.

807. SOKOLSKAYA, B. P.

634.3 : 581.141

**Polyembryony in citrus seeds.** [Russian.]*Soviet Subtropics*, 1938, No. 4 (44), pp. 66-7.

In an attempt to select citrus forms producing seed containing the fewest numbers of embryos it was discovered that the embryos increased in number as the fruits matured. Embryo size and position in seeds varied considerably. Small embryos were the most numerous. Often out of 9-13 embryos only 3-6 would germinate, the indications being that small embryos do not germinate. The number of embryos seems to be characteristic of a given form or variety and is believed to be a hereditary character reappearing in successive generations but with slight seasonal variations. In orange varieties the embryo numbers ranged from 1 to 10, in mandarins from 1-15, in lemons from 1 to 4 and in citrons from 1 to 3. A table (p. 16) shows the citrus forms having the smallest numbers of embryos.

808. SOKOLSKAYA, B. P.

634.31-1.542.22 : 581.163

**A new method for increasing the yield capacity of orange trees.** [Russian, English summary 5 lines.]*Soviet Subtropics*, 1938, No. 3 (43), pp. 60-1.

In 1937 attempts were made at the Introduction Nursery in Sukhum to decrease the shedding of orange flowers by removing the pistils from the unopened flowers. The study was made on 39 flowers on the lowest branch of a single tree [variety not stated.—Ed.]. Untreated flowers on the same branch and on other branches were used as a control. When the fruits were collected, it was found that of the 39 flowers where pistils had been removed 22 bore fruits, whereas of 35 controls only 1 fruit was produced. Data also show that the average size of fruits from flowers treated thus was larger than that of fruits from control flowers. No seeds were found in fruits from flowers where the pistils had been removed. The results suggest that large scale trials should prove valuable.

809. HILGEMAN, R. H., AND SMITH, J. G.

632.111 : 634.3

**Low temperature injury to citrus in the Salt River Valley of Arizona.***Proc. Amer. Soc. hort. Sci. for 1937*, 1938, 35 : 138-42.

The effects on oranges and grapefruit are noted of a frost which showed the thermometer standing often considerably below 25° F. for 7 or more hours on 3 consecutive nights following a 3 week period in which temperatures had been consistently low and so served to harden the trees. In general thrifty grapefruit trees growing in heavy soils and irrigated during the frost suffered the least defoliation and damaged fruit. Valencia oranges usually showed less defoliation when irrigated but results were not conclusive. Generally speaking the rate of drying of the fruit in the 6 week period following the freeze was directly related to the final amount of fruit picked, in that the fruit which dried slowly showed a higher proportion of passable fruit late in the season than that which dried quickly. Refilling of grapefruits occurred in all tests, but it was only of commercial importance in the moderately injured fruits. Both oranges and grapefruits showed recovery, but the recovery was only sufficiently great on fruit which was moderately injured to be of commercial importance.



810. FRIEND, W. H. 634.3-2.19 : 631.415.36

**The reclamation of decadent citrus trees.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 143-6, bibl. 10.*

Attempts to check citrus decline in the Lower Rio Grande Valley are here described. The soil is alkaline calcareous and irrigation is done with slightly saline water. Results point to salinity and alkalinity being the chief causes of decline. Profitable production can again be induced by good orchard management, the advantage of introducing to the soil acid forming materials, together with liberal amounts of organic matter and possibly some minor elements, being indicated by experimental results. The importance of planting trees only where subsoil drainage is adequate is also stressed.

811. PARKER, E. R. 634.3-2.19 : 546.47

**Experiments on the treatment of mottle-leaf of citrus trees. IV.\***

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 217-26, bibl. 4.*

The report presents the results obtained by treating affected citrus trees with various zinc compounds, the respective merits of the compounds being determined by the duration of response to foliage applications. Sprays containing very low concentrations of zinc were most efficient when applied prior to the spring or autumn cycles of growth. The application of copious amounts of dilute sprays was also observed to lengthen the time before the trees began to show definite reversion to mottle-leaf condition. The most important factor, however, was increasing the concentration of the spray to a zinc equivalent of 1.15 lb. per <sup>100</sup>galls; higher increases gave no response, nor at this concentration was there any difference in response to varying the season or rate of application. The addition of several spreading agents also failed to increase the efficacy. The effect of a suitable zinc spray would last 2-4 years. When applied at equivalent zinc concentrations a number of sources of zinc gave good results. Dusts diluted to 10% zinc content were less efficient and results could not be improved by increasing the quantity of dust applied to the tree or by the addition of blood albumin or oil. The nature of the diluent employed did slightly affect the length of duration of the response to the treatment, sulphur or talc being more satisfactory than hydrated lime or diatomaceous earth. The more effective sources of zinc dust are named.

812. STOFBERG, F. J. 632.752 : 634.3

**The biology of the citrus mussel scale (*Lepidosaphes pinnaeformis* (Bouché) Kirk).**

*Sci. Bull. Dep. Agric. S. Afr. 165 (Plant Industry Series 23), 1937, pp. 29, bibl. 10.*

The geographical distribution and economic importance of mussel scale is discussed. The different stages in the life history as well as the biology of the citrus mussel scale are described, and notes are given on its parasitic and other enemies. Control measures are suggested and consist mainly of fumigation.

813. KIRYUKHIN, G. 632.752 : 634.3

**Control of coccids in Abkhazia. [Russian.]**

*Soviet Subtropics, 1938, No. 4 (44), pp. 82-5.*

A report for 1937 on the control of mealy bug and scale by spraying with oil emulsions and by fumigating with HCN on State citrus plantations in Abkhazia. Spraying with oil emulsions gave very little control and it was found that the sprayed plots were more liable to frost injuries. Fumigating was very effective and resulted in increased yields, due to the larger size of the fruits.

\* Part I, *Ibidem* for 1934, 31 : 98-107. *H.A.*, 5 : 268 ; II, *Ibidem* for 1935, 33 : 82-6. *H.A.*, 6 : 848 ; III, *Ibidem* for 1936, 34 : 213-5. *H.A.*, 7 : 978.

814. ILYINSKY, A. M. 632.944  
**Tent fumigation.** [Russian, English summary 12 lines.]  
*Soviet Subtropics*, 1938, No. 4 (44), pp. 77-80.

The history of the development of tent fumigation in U.S.S.R. and in other countries is reviewed. On pp. 78-9 a list is given of insect pests with which 100% control was obtained in U.S.S.R. by HCN fumigation. The dosages and the times of exposure necessary to kill the insects at different stages of development are noted. Of the various cyanides tested by the Institute of Plant Protection all were found suitable for pest control by fumigation. Tests were also made on various plants in which the maximum dosages without scorching were determined. The author considers that the scorching effect of hydrocyanic acid is largely exaggerated and gives data supporting this view.

815. KIRYUKHIN, G. 634.3-2.944  
**Has fumigation an injurious effect on citrus trees after spraying?** [Russian.]  
*Soviet Subtropics*, 1938, No. 3 (43), pp. 59-60.

The author studied the effect of fumigation on citrus trees growing under commercial conditions in Abkhazia (U.S.S.R.) after spraying. Two-year-old citrus trees were used in the experiments [the number of trees subjected to treatments is not stated.—ED.]. The following conclusions were reached:—HCN gas may have an injurious effect on citrus trees frequently sprayed with bordeaux in districts with a low yearly rainfall. No scorch injuries were observed on the plants when fumigation took place 15-20 days after spraying with bordeaux. Citrus trees should not be fumigated later than a month after spraying.

816. DELASSUS, M., AND LAFFOND, M. 634.31-2.944 + 632.951.8  
 Les pulvérisations d'huiles blanches et les fumigations cyanhydriques dans les orangeries algériennes. (**Spraying with white oil and HCN fumigation in Algerian orange groves.**)  
*Bull. Synd. algér. Agrumes*, 9, 1937, pp. 40.

In this bulletin the proper use of white oils and fumigation with hydrocyanic acid gas under Algerian conditions is discussed, particular attention being drawn to the avoidance of plant injury.

817. KOLOTOV, D. G. 632.752 : 634.3-2.96  
**The use of *Cryptolaemus* in the control of insect pests.** [Russian, English summary 8 lines.]  
*Soviet Subtropics*, 1938, No. 3 (43), pp. 93-5.

As the result of his experiments carried out in Abkhazian citrus orchards for 3 years the author considers that *Cryptolaemus montrouzieri* M. affords a very efficient parasitic control of *Pseudococcus gahani* and *Pulvinaria aurantii*. It is stated to be most effective when released in the adult stage at the time when the ovisacs of the pests appear. At a later stage both adult insects and their larvae proved unable to deal effectively with the first generation of *Pulvinaria*. Spraying the trees with emulsions resulted in a migration of *Cryptolaemus*. Data are tabulated.

818. TISSOT, P. 634.63  
 L'olivier dans le bassin méditerranéen. (**The olive in the Mediterranean.**)  
*Rev. Bot. appl.*, 1937, 17 : 586-610, bibl. 40.

The present state of the olive industry and research in the countries bordering the Mediterranean is discussed.

819. PRUSS, A. G. 634.64  
**Pomegranates of the Surkhan-Daria Region.** [Russian, English summary 15 lines.]  
*Soviet Subtropics*, 1938, No. 3 (43), pp. 27-37.

In 1936 studies were made by the Scientific Research Institute of Dry Subtropics on the different varieties and biological characteristics of pomegranates growing in Uzbek S.S.R. In Central

Asia the best pomegranates both as regards quality and yield are stated to be those which come from Sary-Assy region. Varieties are recommended for large-scale planting in different localities. The varieties Cock, Cadan and Shar-Sabzy were found self-sterile. As a result of the study of the flower, flowers with short or medium pistils were found to be sterile or partly sterile. The percentage of fruit setting was greatest in the variety Cock (9%), followed by Kyzyl (3·1%) and Cadan (2·7%). Results are tabulated and illustrated.

820. WOLFE, H. S. 634.651

**Papaya culture.**

*Pr. Bull. Fla agric. Exp. Sta.* **502**, 1937, pp. 2.

Brief notes are given on the cultivation of the papaya in Florida.

821. STOREY, W. B. 634.651-1.523

**The primary flower types of papaya and the fruit types that develop from them.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938*, **35** : 80-2, bibl. 4.

and

**Segregations of sex types in Solo papaya and their application to the selection of seed.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938*, **35** : 83-5, bibl. 5.

In the first paper the flower and fruit types known in Hawaii as types I, II, III, IV, and V are described and illustrated. In the second, notes are given of the work at present in progress at the Hawaiian Experiment Station to elucidate the method of sex inheritance in Solo papaya. Results obtained by self-pollination of hermaphrodite and male plants (occasional perfect flowers) indicate that these types are permanently heterozygous. Further studies contemplated seem likely to indicate a means whereby growers will be able to get supplies of seed that will yield a very high percentage of fruitful trees of good quality and consequently not have to plant more than one tree to a hole, as is the present practice.

822. MARGAR'YAN, A. E. 633.85-1.532

**Vegetative propagation of the tung tree.** [Russian, English summary 17 lines.]

*Soviet Subtropics*, 1938, No. 2 (42), pp. 10-21.

Over a period of 3 years studies were made on the propagation of tung trees in Georgia. The work included grafting experiments with the varieties *A. Fordii*, *A. cordata* and *A. montana*. Ring-budding, shield-budding, patch-budding and other vegetative propagation methods were tried. The author's conclusions may be summed up as follows:—While propagation of tung trees from seed results in a great variation in plant characters, such valuable economic characters as yield and quality may be perpetuated by vegetative propagation. Ring-budding gives the best results (95%-100% take). To obtain *A. Fordii* on its own roots, both ground and air layering can be expected to give up to 100% rooting. All varieties under investigation could be propagated from root cuttings. The topworking of seedling trees of inferior quality is advised.

823. KHUTSISHVILI, G. Z. 633.85-1.8

**The effect of fertilizers on the tung tree.** [Russian, English summary 13 lines.]

*Soviet Subtropics*, 1938, No. 2 (42), pp. 37-40.

In 1932-6 preliminary trials were made at Batum Botanic Gardens with the tung tree *Aleurites cordata*. 220 six-year-old trees were studied for their response to farmyard manure, NPK, NP, NK, KP and no fertilizer. From data which are tabulated the following conclusions were reached:—1. No increase was noted during the first year of application of any fertilizer. In subsequent years the plant's growth, development and yield was most favourably influenced by the following:—(i) complete fertilizer; (ii) NP; (iii) farmyard manure. 2. The effect of farmyard manure during the first year was considerably smaller. 3. NK fertilizers reduced the yield, which is attributed to the presence in soil solution of free aluminium ions or to the lack of phosphorus in the soil.



824. REUTHER, W., AND DICKEY, R. D. 633.85-1.416.8

**A preliminary report on the frenching of trees.**  
*Proc. Amer. Soc. hort. Sci.* for 1937, 1938, **35** : 230.

A preliminary note of a paper to be published by the Florida Experiment Station, Gainesville, in which is described a new disorder of tung trees, termed frenching, and its control by manganese sulphate applied either as a spray or to the soil. Symptoms of frenching shown by the foliage are partial chlorosis, necrotic spots in chlorotic areas and premature abscission.

825. FAWCETT, G. L. 633.88.11.871-1.543

Notas sobre la plantación de eucaliptos. (**Eucalyptus planting.**)  
*Circ. Estac. exp. agric. Tucumán*, **56**, 1937, pp. 6.

The method adopted in Brazil is considered to be best. This consists of transplanting seedlings from the boxes, containing 15-20 plants, as soon as they have reached a height of 25-40 cm. Spring is considered to be the most favourable time for planting, autumn planting being only permissible in districts not subjected to low temperatures. Notes are given on pests.

826. COOPER, J. F. 633.812

**Collecting deer tongue leaves.**  
*Pr. Bull. Fla agric. Exp. Sta.* **501**, 1937, pp. 2.

The leaves of deer tongue (*Trilisa odoratissima* (Walt.) Cass.) contain coumarin, used for flavouring purposes in the manufacture of artificial vanilla extract and in blending tobaccos. Notes are given on methods of collecting and curing the leaf in Florida.

827. SHLYKOV, G. N. 633.85

***Cyperus esculentus*.** [Russian, English summary 27 lines.]  
*Bull. appl. Bot., Leningr., ser. XI*, **2**, 1935, pp. 47-62, bibl. 32.

The main points in the cultivation of *Cyperus esculentus* are discussed. It proves rather more exacting in its environmental requirements than was at first thought and in Russia is suitable only for the humid subtropics. It has possibilities as an oil and forage crop and these could be considerably extended by selection and breeding.

828. MENAGARISHVILI, A. D., AND LEZHAVA, V. V. 631.85 : 634.3 + 633.72

**Phosphate application on subtropical soils.** [Russian, English summary 10 lines.]

*Soviet Subtropics*, 1938, No. 4 (44), pp. 63-4.

The poor efficiency of phosphatic fertilizers was studied in various trials carried out in Georgia, U.S.S.R., and the following conclusions were reached. The method of fertilizer application was found to influence appreciably the efficiency of soluble phosphates on citrus and tea plantations. The local usage of mixing the fertilizers with a limited amount of soil and the method of turning in the fertilizer as near as possible to the active roots of the plant gave the best results. For annual crops with shallow root systems the method of mixing fertilizer with the soil to moderate depths was best.

829. HAIDAMAKIN, V. I., MAKASHVILI, A. K., YABROVA, V. S., AND YAROSHENKO, P. D. 632.51 : 633.72

**Weeds of the humid subtropics and their control.** [Russian, English summary 1 p.]

Printed for the U.S.S.R. Scientific Research Institute of Humid Subtropics by the publishers of *Sovetskaya Abkhazia*, Sukhum, 1936, pp. 135, bibl. 52.

Botanical descriptions are given of foreign and local weeds growing (1) in the tea areas, (2) in the northern region of the humid subtropics and (3) in intermediary regions adjacent to the zone of the humid subtropics. Notes are given on morphological features, ecology, physiology, biological characteristics and control. The following weeds are the commonest and most objectionable :—*Pteridium lanuginosum*, *Sorghum halepense*, *Calamagrostis Epigeios*, *Paspalum*

*digitaria*, *Cynodon dactylon*, *Convolvulus arvensis*, *Calistegia sepium* and *C. silvatica*, *Paspalum dilatatum* and *P. Thunbergii*, *Pollinia imberbis*, *Digitaria sanguinalis*, *Anthoxanthum odoratum*, *Miscanthus sinensis*, *Rubus* spp. and the parasitic *Cuscuta* and *Orobanchae*. Control measures are discussed separately for all species mentioned and a description is given of agricultural implements now in use on tea plantations in U.S.S.R. Illustrations are given of weeds and cultivators.

830. GEORGOBIANI, J. A., AND OKULOV, A. P. 632.951.23  
**Determination of oil spray residue on the leaves of subtropical plants.** [Russian.]  
*Soviet Subtropics*, 1938, No. 4 (44), pp. 80-2.

Illustrated descriptions are given of two apparatus for determining oil spray residue in paraffin ether solutions. The advantage of the first is that it enables analyses to be made quickly, and of the second that a great number of leaves can be analysed while using only a small amount of the solution. The second method entails rather more work in measuring and filling the solution. The apparatus described are adapted from those devised by Swain and Green [no reference given.—ED.] and are briefly described.

### TROPICAL CROPS.\*

831. TRAPNELL, C. G., AND CLOTHIER, J. N. 631.4 + 63  
**The soils, vegetation and agricultural systems of North-Western Rhodesia.** The Government Printer, Lusaka, 1937, pp. 81, 15s.

A report of the ecological survey of North-Western Rhodesia, based on field work undertaken in 1932, 1933 and 1934. Pure plant ecology is to a certain extent omitted in the present paper in favour of an ecological classification of the country for agricultural purposes.

832. CEYLON DEPARTMENT OF AGRICULTURE. 631.459  
**Soil erosion—general considerations.**  
*Leaflet. Dep. Agric. Ceylon* 100 (Soil Erosion Leaflet No. 1), 1936, pp. 3.  
CEYLON DEPARTMENT OF AGRICULTURE. 631.459  
**Soil erosion.**  
*Bull. Dep. Agric. Ceylon* 89, 1936, pp. 8.

The first paper gives a general and the second a more detailed account of soil erosion in Ceylon. Various methods of control are described and, in the second paper, illustrated.

833. HARRISON, E. 631.459  
**Soil erosion.**  
*Memor. Govt. Tanganyika Territory*, 1937, pp. 22.

A comprehensive description of the problems of soil erosion in Tanganyika and of the measures taken to counter the ill-effects of the careless use of land.

834. CEYLON DEPARTMENT OF AGRICULTURE. 631.543  
**The planting of young trees.**  
*Leaflet. Dep. Agric., Ceylon* 96, 1936, p. 1.

Too deep planting of young trees is detrimental. The soil level mark on the stems of budded nursery material, usually assumed to be a reliable guide to the correct depth, is so for trees from nursery beds or pots, but not always for imported grafted plants. These are usually received in a dormant condition and cannot be planted out immediately on arrival. The practice is to transfer them to pots until such time as they are required. The period between receipt and final

\* See also 634.

distribution is normally a short one, and in order to give stability to the plants and to dispense with staking they are planted deeply in pots, the soil being brought well up the stem. In such cases the soil level mark is much higher than the proper planting level.

835. CEYLON DEPARTMENT OF AGRICULTURE. 632.97

**Summary of legislation and regulations regarding the import of plants into Ceylon for the purpose of preventing the introduction of pests and diseases of cultivated plants.**

*Leaflet. Dep. Agric. Ceylon 115, 1937, pp. 2.*

The leaflet contains a list of plants and seeds of which the importation into Ceylon is permanently or provisionally prohibited.

836. SIEVERS, A. F., RUSSELL, G. A., LOWMAN, M. S., FOWLER, E. D., ERLANSON, C. O., AND LITTLE, V. A. 632.951.1

**Studies of the possibilities of Devil's Shoestring (*Tephrosia virginiana*) and other native species of *Tephrosia* as commercial sources of insecticides.**

*Tech. Bull. U.S. Dep. Agric. 595, 1938, pp. 40, bibl. 8.*

Studies were made of the taxonomy and insecticidal properties of twelve of the seventeen species of *Tephrosia* occurring in the South and East of the United States. Only *T. virginiana* and *T. latidens* were found of possible commercial interest.

837. KRUKOFF, B. A., AND SMITH, A. C. 632.951.1

**Rotenone yielding plants of South America.**

*Amer. J. Bot., 1937, 24: 573-87, bibl. 7.*

Ten species of S. American rotenone yielding plants are discussed in detail, including 3 new species (*Lonchocarpus sylvestris*, *L. Martynii* and *L. utilis*). Notes of use to field workers have been incorporated.

838. PANSHIN, A. J. 632.951.1

**Wood anatomy of certain South American rotenone yielding plants.**

*Amer. J. Bot., 1937, 24: 587-91.*

Wood anatomy of stems and roots of a group of rotenone yielding plants of S. America (*Derris* and *Lonchocarpus*) is presented in detail. There is a striking similarity in the structure of the xylem between the species, and the anatomical variations recorded were mostly those of size and frequency of different types of wood elements. These variations were often no greater than those found in the sections of stem and root taken from different parts of the same plant. Data are at present insufficient to decide whether the variations in size and number of xylem elements are sufficiently constant to provide a reliable means of separation for these closely allied species. The differences of root wood colour in some cases appear to be constant enough to be of use in the field identification of these plants. [From author's summary.]

839. CEYLON DEPARTMENT OF AGRICULTURE. 632.951

**Efficient spraying for the control of insect pests.**

*Leaflet. Dep. Agric. Ceylon 120, 1937, pp. 3.*

General directions on the use of stomach poisons and contact insecticides in Ceylon.

840. HARGREAVES, E. 632.6/7

**Some insects and their food-plants in Sierra Leone.**

Reprinted from *Bull. ent. Res.*, 1937, 28: 505-20.

A list of insects attacking economic plants in Sierra Leone arranged alphabetically by families, genera and species.



841. COCHRAN, W. G.

519 : 581.084.2

**Some difficulties in the statistical analysis of replicated experiments.***Emp. J. exp. Agric.*, 1938, 6 : 157-75.

In recent years the experimental designs known as the latin square and randomized blocks have come to be used almost universally and have been applied to experiments covering a wide range of biological subjects. The method of testing the significance of treatment differences within these experiments is based upon the method known as the analysis of variance. This method is based upon the assumption that the variability of all sets of treatments in the experiment is alike and normal in its distribution. A single estimate of error is obtained which is applicable to all treatment comparisons. Experimenters who have much experience of the use of these methods have, however, on occasion been in doubt whether the analysis of variance is in fact applicable to their data. It may be that one or two treatments differ very greatly from the remainder and evidently have a much higher or lower variability. On the other hand the data may consist of small whole numbers or percentages, the variation of which is not normal, but approximates more nearly to a *poisson* or a *binomial* distribution. In either event special measures are needed, if the significance of the results is to be accurately determined. The author describes several experiments in which such difficulties have arisen and suggests measures with which to combat them. In the event of an unbalanced experiment, he suggests splitting up the error variance into those parts appropriate to sets of treatments which are more nearly alike. Where the data are not normal he discusses the use of various transformations of the original data, which will give a normal distribution and can thus be analysed in the ordinary way. While the author emphasizes that the necessity for these transformations is the exception rather than the rule, his clear account of their use when need arises will be a great help to research workers who have worried over these difficulties in the past. T.N.H.

842. KEUCHENIUS, A. A. M. N. 633.88 + 633.73 + 633.912 + 633.72 + 634.6

Overzicht van de ondernemingscultures in het rayon West-Sumatra gedurende 1936. (A review of estate cultivations in West Sumatra during 1936.)

*Bergcultures*, 1937, 11 : 510-8.

*Quinine.* During the last two years growers have been endeavouring to plant grafted plants rather than seedlings, experience having shown that in most cases under local conditions these have the longer cycle of utility. Established plantations have a regular manurial programme in which lime, nitrates and phosphates are given, the former being applied separately at 1½-year intervals and the two latter in combination at ½-yearly intervals between the lime applications. By the use of grafted plants and regular manuring the profitable life of the plantations can be extended from the 9-12 years usual in seedling plantations to 15-18 years. Trial grounds have been laid out on many estates not only for manurial and other experiments but for the establishment of suitable clonal parent plants advisable in view of the heavy mortality among scions obtained from Java and because it has been found that imported clones often behave very differently to expectations derived from their performance in their country of origin. In order to get strong thrifty plants in the nursery beds the latter must be made exclusively on virgin forest land, though, at a pinch, land which has lain fallow for some years and has acquired a covering of shrubs or trees may be used. *Coffee.* The low prices have caused the abandonment of much of the less fertile coffee land. Little manuring is done. Side bark grafting has been attempted with unproductive trees. The few scions which took grew freely. *Rubber.* There is little seasonal difference in yield throughout the year. An average tapper will collect about 30 litres of latex per day, equal to 9 kg. of good quality dry rubber. 1% Izal + a little milk of lime is used for disinfecting the tapping wounds. Little is done in the way of upkeep. Ground cover, sometimes leguminous, is maintained. The oldest plantations are being rejuvenated by replacement by means of selected clonal or seedling material. Except in the case of a few nurseries manuring is not practised. *Tea.* On certain estates attempts are being made to increase the yield of the plantation by extensive grafting, by the laying out of gardens for the maintenance of seed and graft parents, by selection of seedlings and by the keeping of individual yield records. Green manuring is universally practised. *Oil palm.* The industry has barely

started, about 68 ha. having been planted in 1936. A few other minor crops are grown. In each section a brief note is given of the pests and diseases which affect the crop.

843. SHEPHERD, E. F. S., AND ORIAN, G. 587.36  
**Germination experiments on " pois mascate " seed (*Mucuna Deeringiana* (Bort) Holland).**  
*Bull. Dep. Agric. Mauritius (sci. series) 24, 1937, pp. 8.*

Studies were made of the germination capacity of large and small " pois mascate " seeds, which were obtained locally from the Black River district. The following conclusions were drawn :— A varying quantity of " hard " seed occurs in any lot of " pois mascate " seed, whether large or small. Hard seeds germinate, if at all, after a very prolonged period. Both the speed and the capacity for germination of the hard seed are increased by immersing the seed in cold concentrated sulphuric acid for  $\frac{1}{2}$  hour, with a subsequent thorough washing. Hot water treatment had no great effect on " hard " seeds, while the effect of immersion in milk of lime for 24 hours was disastrous.

844. CEYLON DEPARTMENT OF AGRICULTURE. 633.18  
**Paddy cultivation. (How to obtain higher yields.)**  
*Leaflet. Dep. Agric. Ceylon, 1937, 93, pp. 2.*

Inexpensive methods are described here by which paddy growers in Ceylon can increase their yearly yields. Notes are given on seed selection, improved machinery, transplanting, manuring, threshing, and various other points in cultivation.

845. EVANS, H. 633.61 : 581.144.2  
**A preliminary study of root characters as affecting drought resistance in two sugarcane varieties and in their seedlings.**  
*Bull. Dep. Agric. Mauritius (Sugarcane Res. Sta.) 14, 1937, pp. 20.*

A study of the main characters and behaviour of the root system of sugarcane parent types D.109 and POJ.2364 and seedlings of the cross POJ.2364  $\times$  D.109. The seeds from the cross were germinated in boxes, and 20 good seedlings transplanted into pots. Simultaneously 20 one-eye cuttings of D.109 and of POJ.2364 were germinated in similar pots. They were transplanted into the field at the same time. The root system was examined when the stools were 11 months old. Three stools each of D.109 and POJ.2364 and 5 of the seedlings of this cross were examined by the direct examination method. The field where the canes were planted had rather a small depth of superficial soil (4-5 in.) and the subsoil was also rather hard. A comparison of the root systems of the seedlings and the parents brings out the following points among others :—A closer similarity was found between the root system of the seedlings and that of the female parent (POJ.2364) than with that of the male parent (D.109). The behaviour of the plants when the major portion of the superficial root system was removed also showed a greater similarity between the seedlings and POJ.2364 than between the seedlings and D.109. Further, absorbing surface values which were of the same order in POJ.2364 and the seedlings were 2-3 times as great in D.109. There are indications, however, that such differences may be due to a difference in the periodicity of the growth cycle. Studies are being carried on in that direction. There is, moreover, considerable evidence that the initial virgin crop of hybrid seedlings possesses an enhanced but non-persistent hybrid vigour. The root systems of plants derived from cuttings of such hybrids are now under examination.

846. EVANS, H. 633.61 : 581.144.2  
**Studies on the absorbing surface of sugar-cane root systems.**  
 Reprinted from *Ann. Bot. Lond.*, 1938, 2 : 159-82, bibl. 13.

A method is described, original in many respects, of determining the absorbing surface of sugar cane root systems. The results of the determination of the absorbing surfaces of 3 important commercial varieties differing markedly in the early growth of their root systems on one soil type are given. At 12-14 months old POJ.2878 has a total root length of only 54% of that of

White Tanna, but an absorbing system 8 times as extensive ; these great differences are attributed to a difference in the cycle or periodicity of growth, root development in White Tanna being early and vigorous while in POJ.2878 root development was slow and there was therefore at maturity a considerably greater proportion of younger roots. There are, however, indications that there may be a difference in the root-hair density in different varieties unconnected with differences in the periodicity of growth. The fact that there is no relationship whatever between the total length or weight of all roots and the extent of the absorbing surface is of great importance to the future conduct of root investigations. The importance of the absorbing surface in the selection of canes resistant to drought and to *Phytalus* root eating larvae is discussed.

847. CROSS, W. E. 633.61  
 El cultivo de la caña de azúcar en Tucumán. (**Sugar cane cultivation in Tucuman.**)  
*Bol. Estac. agric. Tucumán*, 26, 1937, pp. 16.  
 CROSS, W. E.  
 La estacion experimental agricola de Tucumán frente a la crisis de sobre-produccion azucarera. (**The Agricultural Research Station of Tucuman faces the crisis of over-production of sugar.**)  
*Bol. Estac. agric. Tucumán*, 25, 1937, pp. 24, bibl. 142.

The main points in the cultivation of sugar cane and the methods which are considered best for Tucuman Province are described in the first bulletin. In the second the ways and means of avoiding over-production in the Argentine are discussed and the following points are considered : encouragement of increased sugar consumption, and of increased consumption of raw cane, increasing the consumption of other products made from sugar, reduction in costs of sugar production and manufacture, more thorough utilization of by-products of sugar manufacture, and finally partial replacement of sugar cane by other plants.

848. RANDS, R. D., AND DOPP, E. 633.61-2.41  
**Influence of certain harmful soil constituents on severity of *Pythium* root rot of sugarcane.**  
*J. agric. Res.*, 1938, 56 : 53-67, bibl. 14.

Under Louisiana conditions of poorly drained, heavy clay soils the presence of salicylic aldehyde was found to increase significantly root rot caused by *Pythium arrhenomanes* in sugarcane. It is thought that the presence of this or similarly behaving compounds might partly account for the severe attacks of root rot noted in all but the most resistant varieties.

849. KIKUTA, K., WHITNEY, L. D., AND PARRIS, G. K. 633.689  
**Seeds and seedlings of the taro, *Colocasia esculenta*.**  
*Amer. J. Bot.*, 1938, 25 : 186, bibl. 3.

The taro is always propagated asexually and seed is produced so seldom as to have given grounds for the belief that it seeds no longer. The appearance of a fruiting spathe at the Hawaii Experiment Station of an upland variety has enabled a study to be made of the seeds and seedlings. This forms the subject of this paper.

850. VAN DER VEEN, R. 633.71-1.67  
 Drainage van tabaksgronden in Besoeeki. (**Drainage of Besoeeki tobacco soils.**)  
 [English summary 7 lines.]  
*Meded. besoeek. Proefst.*, 61, 1938, pp. 1-14.

An account is given of the effect of draining tobacco soils in Besoeeki. Because of the frequently rather quick movement of the soil water, in wet areas deep ditches running perpendicular to the movement of this soil water are required in order to catch as much water as possible. From these the water must be carried off quickly by a few dykes cut straight to the rivers. This method permits the draining of large areas with only a few ditches.



851. VAN DER VEEN, R. 631.4 : 633.71  
De Raoenggronden in het gebied van de Besoeeki tabakskultuur. (**Raung soils in the Besoeeki tobacco region.**) [English summary 1½ pp.]  
*Meded. besoeek. Proefst.*, 60, 1938, pp. 23.

An examination of the soils around the still active volcano Raung showed that they are extremely rich. The physical structure of both soils and subsoils is, however, often very undesirable, hard pan and other formations unfavourable to plant growth being frequent. In many places also the incidence of soil water less than 1 metre below the surface prevents tobacco growing.

852. VAN DER VEEN, R. 631.411.4 : 633.71  
Veengronden in Besoeeki. (**Peat soils in Besoeeki.**) [English summary 30 lines.]  
*Meded. besoeek. Proefst.*, 61, 1938, pp. 24-39.

Notes made of a study of four types of peat soils in Besoeeki (Java) include the following :—The peat layers were usually 20-100 cm. in depth. The reaction of the different peats was acid, with pH values of 3 and 4. The high acidity is ascribed to the high sulphur content of the peat. The Ca-content was found to be usually higher than 0.5%. The peats also contained much iron and a very high percentage of SiO<sub>2</sub> (80% of the ash), which was mostly of organic origin. The content of other minerals was found high enough to promise a rich soil after intensive drainage for some years to wash out the excess of sulphur. Experiments are being made to turn these soils into good tobacco soils.

853. VAN DER VEEN, R. 632.8 : 633.71-1.453  
Tjemara-ziekte (frenching) bij tabak als vergiftigingsverschijnsel. (**Frenching in tobacco as a symptom of poisoning.**) [English summary 14 lines.]  
*Meded. besoeek. Proefst.*, 61, 1938, pp. 15-20.

Attempts were made to produce frenching of tobacco artificially by giving the plants certain quantities of reduced iron, but no symptoms of frenching were obtained. There are indications that frenching may possibly be due to thallium poisoning, but insufficient evidence to justify this hypothesis was obtained during the experiments.

854. CARPENTER, P. H. 633.72  
**The application of science to modern tea culture.**  
*Emp. J. exp. Agric.*, 1938, 6 : 1-10.

The improvements brought to tea-cultivation through the medium of scientific research are reviewed. Nitrogenous manuring was first developed by Mann of the Indian Tea Association by means of locally made rape seed cake ; subsequently other organic materials such as fish, sterilized animal meal and various kinds of cake and debris obtained from specially grown leguminous trees were used. Its bulk is often advanced as an additional asset of organic manure, but at Tocklai over 4 years an annual application of 5 tons of cattle manure equalling 60 lb. of nitrogen, has given an increase of only 765 lb. of tea per acre compared to the 1,580 lb. increase obtained during the same period with 60 lb. of nitrogen in the form of sulphate of ammonia, and over a period of 17 years no improvement in tea or soil has been attributable to bulk as against an absence of bulk in manures. In tea slow acting manure is an inefficient manure. Repeated small doses of a soluble manure are of no greater efficacy than their total amount given annually in one application even when the latter is very large. In the acid soils of North-East India a soluble manure such as sulphate of ammonia broadcast in spring gives the same increase in yield whether it is left on the surface or lightly turned in. No depletion of organic matter of the soil through the use of sulphate of ammonia is to be feared, if the tea prunings are buried, as is customary, in the soil of the plantation. It has been conclusively shown that the yield and quality of tea can be maintained by the use of moderate applications of nitrogen only, and this discovery has made possible a reduction of 25% or more in the cost of manuring. *Cultivation.* Tillage merely provides a good seedbed for weeds. Hand weeding results in erosion. Selective weeding leaving only shallow rooted plants is most practicable. Under such conditions

combined with suitable nitrogenous manuring the bushes grow rapidly and soon cover the soil, their roots come to the surface and suppress such weeds as are left. *Variety and quality.* The next big development in tea culture is likely to be in the establishment of pure strains. At present there is little uniformity and vegetative propagation is still undeveloped, though research is active. *Pests and diseases.* Satisfactory control measures have of recent years been established for all the more serious pests and diseases. *Manufacture.* The general process of manufacture has undergone little change except in improvements in machinery, but the realization of the ill effects of the uncontrolled development of micro-organisms in factories has contributed to the improvement of tea. The chemical constitution of the tannin found in tea is now known to differ from the tannic acid (digallic acid) of the British Pharmacopoeia, thus the detrimental physiological reactions of digallic acid can no longer be misrepresented as attributable to tea-drinking.

855. ROGGEN, M. A. VAN. 633.72 : 575.42 : 578.08  
 Eenige ervaringen verkregen met het zoeken van moederboomen in thee  
 tuinen door middel van selectie op-het-oog. (**Selection by eye of mother trees  
 in tea gardens.**)  
*Bergcultures*, 1938, 11 : 725-8.

Suitable mother trees can be consistently selected by eye in tea gardens if the following conditions are fulfilled. The trees from which selection is to be made should be numerous and not too heterogeneous, their environment should be fairly uniform, and the time should be fairly remote from past or future pruning periods. A disturbing factor is the possibility of periodic variations in the amount of flush of the tree. This is overcome by the selection being repeated at intervals about six times.

856. TANGANYIKA TERRITORY DEPARTMENT OF AGRICULTURE. 633.73  
**Quarterly notes of the Coffee Research and Experiment Station, Lyamungu,  
 Moshi, 3, 1937, pp. 7.**

As a result of the investigations carried out during recent years at the Research Station some definite rules are laid down which should be followed by planters desiring to select trees for future propagation. *Selection.* The tree selected should be a healthy vigorous specimen of its type. Any tree which has perceptible environmental advantages over its neighbours should be discounted. The yield of trees spaced 9 ft.  $\times$  9 ft. should not fall below 300 oz. of cherry in any one season. The cherry should be treated in the ordinary way and reduced to parchment and thoroughly dried. The total parchment for the whole season should be thoroughly mixed and divided into four heaps, one of which is selected at random and the process repeated until a representative random sample of 350 beans is obtained. Such samples should be sent by the planters to the station for examination of bean characteristics. *Vegetative propagation.* The rooting of *Coffea arabica* cuttings was accelerated by the use of Hormomone A, obtained from the Imperial Chemical Industries. *Soil investigations.* Fluctuations of nitrate in the soil under various climatic conditions have been studied. The effectiveness of vegetable mulch in conserving soil moisture is shown.

857. TANGANYIKA TERRITORY DEPARTMENT OF AGRICULTURE. 633.73  
**Quarterly notes of the Coffee Research and Experiment Station, Lyamungu,  
 Moshi, 5,\* 1938, pp. 12.**

The results of observations made on soils at Lyamungu during 1937-8 are summed up as follows : (i) During cold weather when growing conditions are poor, nitrate production under banana trash was appreciably higher than on bare soil or under grass mulch. (ii) During a period of warmer weather with occasional beneficial showers of rain nitrate production under banana trash was considerably higher ; the grass mulch used, however, depressed nitrification to some extent. (iii) During the hot dry weather with occasional useful rain nitrate content in bare soil was of the

\* For No. 4 see *H.A.*, 8 : 558.

same order as that under banana trash, but the depressing effect of the grass mulch was maintained. Notes are also given of spray experiments and of a form of dieback which discloses itself by yellowing of the leaves followed by the twigs and branches becoming bare and black. Investigations on pests suggest that when the incidence of *Antestia* exceeds an average of 3 per tree or of capsid 6 per tree, control measures should be undertaken.

858. OTTOLANDER, W. T. 635.977.8 : 633.73  
Gegevens betreffende het schaduwvraagstuk. (Notes on the shade question.)  
*Bergcultures*, 1937, 11 : 66-71, 145-9, 176-81.

Considerable data on the possibilities for use as shade, chiefly for coffee, of a great number of plants have been collected and are here discussed from all aspects. Many of the trees suggested have secondary uses and can be employed as green manures or for their products such as rubber (several kinds), timber or bark.

859. POUND, F. J. 633.74-1.8  
Manurial experiments on cocoa in Trinidad.  
*Publ. Dep. Agric. Trinidad and Tobago*, 1938, pp. 42, bibl. in text.

Manurial experiments on cacao have been carried out in Trinidad for a number of years, but the chief advances have taken place since 1930. In this bulletin a number of the more conclusive experiments carried out in these later years on various soil types are summarized and provide information which should be of considerable use to planters. The general conclusions to be drawn are that the whole success of fertilizers depends on the health, vitality and inherent bearing capacity of the tree being reasonably good; that trees on well drained soils respond more obviously than those on heavy clays, though this may be largely due to poor vitality of the trees from lack of cultivation; that no fertilizer can be named which is of value to cacao requiring draining and pruning, but that given good conditions, phosphates and superphosphates, applied early in the dry season at the rate of 2 lb. per tree for several years in succession, have proved valuable for black marl and for well drained calcareous and alluvial clays. Potash seldom repays the cost on these soils, but is efficient on sandy loams and certain detritals and schists, and in such cases phosphates appear to confer additional benefits. The value of organic debris is very great.

860. GOLDHAUSEN, M. K. 633.815  
Aroids. [Russian, English summary 28 lines.]  
*Bull. appl. Bot. Leningr.*, ser. XI, 2, 1935, pp. 5-46, bibl. 33.

In 1929-33 taro, *Xanthosoma sagittifolium* and arrowroot have been tested under the conditions obtaining in Abkhazia (Sukhum). The following conclusions were reached:—Of all taro varieties (*Colocasia antiquorum* Schott) the early forms of Japan, Africa, West India and America proved the best adapted to the Soviet subtropics. The African form of taro produced in Sukhum yields of 600-700 g. per plant, the American forms up to 320 g. per plant, and the West Indian up to 330 g. The yield of taro under Sukhum conditions was 10-12 tons per ha. Starch content in the tubers was up to 27.1%, protein content up to 2.7%, and sugar content up to 1.7%. The yield of *Xanthosoma* tubers was comparatively low (120 g. per plant) possibly owing to late planting. In experiments with arrowroot *Maranta arundinacea* L. (1932-3) the plants attained in Sukhum a height of 1 m. and their vegetative period was very long. The yield of tubers was up to 300 g. per plant.

861. CEYLON DEPARTMENT OF AGRICULTURE. 633.842  
Chillies.  
*Leaf. Dep. Agric. Ceylon* 112, 1937, pp. 3.

The main points in the cultivation of chillies (*Capsicum annum* L.) in Ceylon are discussed. Notes are given on the principal varieties, soils, irrigation, nursery practice, transplanting, weeding, picking, curing and yields.



862. PARSONS, T. H. 633.88  
**A list of medicinal herbs, indigenous and exotic, that can be cultivated in Ceylon.**

*Bull. Dep. Agric. Ceylon* **91**, 1937, pp. 12, 25 cents.

This is a list of medicinal plants native to and introduced into Ceylon. No description is given of the medicinal value of the plants but this can be found by reference to the quoted authority. The arrangement follows the systematic classification of Trimen's *Flora of Ceylon*. The study of medicinal plants is now being undertaken at the Botanic Gardens, Peradeniya, and the purpose of this list is to assist students and collectors.

863. RINGOET, A. 633.88.51  
**La culture du quinquina. (Quinine culture.)**

*Publ. Inst. nat. Étude agron. Congo belge, sér. tech.* **17**, 1938, pp. 42, bibl. 17.

World consumption and world production of quinine is reviewed, the possibilities of cinchona cultivation on a large scale in the Belgian Congo are discussed and the lines on which future research would be most profitable are suggested.

864. BRODSKY, I., AND FOGEL, A. 633.88.51  
**Quinine culture on the "III International" State Farm.**

*Soviet Subtropics*, 1938, No. 2 (42), pp. 100-1.

Field trials, started in 1936, showed that Pitzunda's sandy loams of high humus content are suitable for cinchona cultivation. October and December were found to be the best months for grafting. Plants from such grafts then had an average height of 80-85 cm. and their leaves weighed on an average 300-350 g. at the end of a year. The best time for planting is 1-20 May. Fertilizer trials (under somewhat un-uniform conditions) indicated that the highest yields are obtained from plots receiving nitrogen and phosphorus.

865. KREYER, G. K. 633.88.51  
**The cultivation of cinchona in U.S.S.R. [Russian.]**

*Soviet Subtropics*, 1938, No. 3 (43), pp. 18-27.

As a result of continuous studies at the Batum Botanic Garden and elsewhere it was found that cinchona trees cannot be cultivated in the Soviet subtropics by the methods adopted in other countries. Thus in the Soviet subtropics they must be maintained in the shrub stage and never allowed to develop into trees. The most suitable method of reproduction under the conditions in South Russia is vegetative propagation by means of softwood cuttings rooted under glass or in the nursery, though at present nursery seedlings are also used owing to the demand for plant material. Points needing further investigation are:—1. the temperature and humidity requirements for optimum rooting of cuttings and whether rooting in the nursery is preferable to rooting in boxes under glass before transplanting to the field; 2. the most suitable spacing in the nursery beds; 3. the production of high quality propagating material under commercial conditions. Notes are given on the selection of parent trees, production of cuttings, root stimulants and the so-called "permanent cutting propagation" (in which prior to transplantation its top and a lateral shoot are removed from the rooted cutting and used for propagation). Propagation from seed as used in other countries is discussed. It is stated that in these countries seedlings are thought to have stronger root systems than plants raised from cuttings. Sexually reproduced trees are also said to produce considerably higher yields than those reproduced vegetatively. Damping off is prevalent with seedlings and the preventive methods used abroad are discussed.

866. DIRECTOR, PROEFSTATION WEST-JAVA. 633.912-1.541.1  
**Aanbevolen Heveaplantmateriaal voor het seizoen 1937/1938. (Hevea clones recommended for the 1937/38 season.)**

*Bergcultures*, 1937, **11**: 1640-3.

At the conclusion of a report on hevea clones recommended for present planting it is stated that it has been shown without doubt that it pays to use strong growing and potentially high yielding

seedlings as rootstocks because of the favourable influence of such stocks on the scion. Seed for rootstocks, however, must be cheap, and seed of which both parents are known is not. Certain "illegitimate" clones are mentioned of which the seed is both satisfactory and cheap, but, failing this, if only seed of unknown genetical make-up is available, much can be done by selection in the seed bed.

867. HAINES, W. B. 633.912-1.8  
**Manuring hevea. II.\* A revision of experimental results by means of a sampling method for yield.**  
*Emp. J. exp. Agric.*, 1938, 6: 11-19, bibl. 2.

A new system of recording yields by a sampling method has been introduced in the Dunlop manurial experiments on rubber, which has improved the reliability by avoiding certain human sources of error and has increased the amount of detailed information obtained. The first revision of one set of experiments previously described in the journal indicates that the complete fertilizer has usually a significant superiority over nitrogen alone, a result which was not supported in the conclusions formerly expressed. [Author's summary.]

868. HEUBEL, G. A. 633.912-2.953  
**Tapvlakbehandling van *Hevea brasiliensis*. (Treatment of tapping wounds in hevea.)**  
*Bergcultures*, 1937, 11: 454-62, bibl. 24.

A thorough investigation is made of the merits and demerits of a number of proprietary and other fungicides used for the disinfection of tapping wounds in *Hevea*.

869. SCHWEIZER, J. 633.912: 631.556.8  
**Over den invloed van rustperioden op de productie van *Hevea brasiliensis*. (Influence of a rest-period on the yield of *Hevea brasiliensis*.)**  
*Bergcultures*, 1937, 11: 411-6, bibl. 8.

Experiments have been carried out for several years in Java to discover the influence on yield of a rest period or a delayed first tapping of young trees. There is a preliminary discussion on the physiological aspects of the rest period, followed by an examination of data obtained from practical experience in plantations. Evidence from definite investigation is then produced and the following conclusions drawn. Delaying the first tapping of young trees has no favourable influence whatever on future yield, in fact regenerated bark has a distinctly greater latex flow than virgin bark. The degree of influence of a rest period of a few months on a plantation in normal tapping depends on the condition of the trees. The more vigorous it is, the less marked will be the reaction to a rest period and the sooner will such reaction subside. Five months is given as the maximum duration of increased yield following a rest in a normal plantation and actually it is more likely to be over in 3 months.

870. LEBEDEV, A. N. 633.919-1.5  
**Cultivation methods with Guayule seedlings.** [Russian, English summary 23 lines.]  
*Soviet Subtropics*, 1938, No. 2 (42), pp. 26-34, bibl. 12.

A report from the U.S.S.R. Rubber and Guttapercha Institute for 1936, containing a full description of the methods of growing guayule seedlings (*Parthenium argentatum*). The following notes are taken from the summary. Under moist subtropical conditions the following rotation of crops is recommended: (1) green manure crop as a fallow; (2) guayule (nursery); (3) guayule. The quality of recently harvested seed was found to improve if it was kept 5-7 days at 45-60° C., resulting in a 4 times greater vitality and a 6 times greater germination. The germination capacity of guayule seed was found to increase considerably if prior to planting the seed was first soaked and subsequently dried to a friable stage. Guayule may be sown when the average

\* I. Haines, W. B. and Guest, E. "Recent experiments on manuring *Hevea*, and their bearing on estate practice." *Ibidem*, 1936, 4: 300-24. *H.A.*, 6: 917.

daily temperature of the air reaches 15° C. and the temperature of the surface soil 18-20° C. The seed should be covered with 2-4 mm. soil, a greater or a smaller depth of cover having an adverse influence on density of stand. Phosphates proved to be the best fertilizers in Azerbaijan. Nitrogenous fertilizers showed no effect, while potassium was depressing. Phosphates turned in to a depth of 18-20 cm. gave the best results. Seed beds must be kept weed free.

871. PETYAEV, S. I. 633.956

**Camphor tree\* cultivation.** [Russian, English summary 20 lines.]

*Soviet Subtropics*, 1938, No. 3 (43), pp. 63-70.

A detailed description is given of agricultural practices involved in camphor tree culture in Western Caucasus. Notes are given on the selection and disinfection of seed. The germinability of seeds with seed coats removed is said to be double that of seeds with seed coats. Camphor tree plantations are stated to benefit from green manuring, especially plantations laid out on badly exhausted and intensively podsolised soils. For green manuring in spring the following crops are recommended: *Vigna sinensis* E., *Phaseolus calcaratus*, *Crotalaria spectabilis* and *C. sericea*, *Dolichos biflorus* L. and *D. Lablab* L., *Stizolobium*, *Soja hispida* Mek., *Lupinus albus*, *Lupinus luteus* and *Vicia Faba* L.

872. GALANG, F. G., LAZO, F. D., AND AGATI, J. A. 634.441 : 581.47

**Influence of the number of leaves on the development and quality of Carabao mango fruits.**

*Philipp. J. Agric.*, 1938, 9 : 61-76, bibl. 10.

The methods used were defoliation and girdling of twigs. The former proved unreliable owing probably to the interdependence of adjacent twigs. Girdling produced more uniformity. From the data presented in the paper it is concluded that at least 10 leaves were required to support a fruit of satisfactory quality and that while 30-50 leaves gave a great increase in size, the maturity was later and irregular. The average weight of fruits on the sunny side of the tree was about two-thirds as great as that on the shady side, suggesting that the length of daily exposure of the leaves to sunlight influenced the development of the fruit.

873. JONES, W. W. 634.57 : 665.3

**The physiology of oil production in the macadamia (*Macadamia integrifolia* Maiden and Betale).**

*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, 35 : 239-45, bibl. 13.

Very little oil formation takes place in macadamia nuts until the hardening of the shell about 90 days after flowering. It ends, after rapidly increasing for 70 days, about 50 days before the maturity of the nuts. Nitrogen in the kernel decreases with oil formation when calculated as a percentage of total dry weight, but increases when calculated as a percentage of the ether extract residue. Reducing sugar decreases and sucrose (expressed as invert sugar) increases with oil formation up till the end of the period of rapid oil formation, after which it decreases until harvest.

874. BEAUMONT, J. H., AND MOLTZAN, R. H. 634.57

**Nursery propagation and topworking of the macadamia.**

*Circ. U. S. Dep. Agric.* 13, 1937, pp. 28.

*Macadamia ternifolia*, the rough-shell, and *M. ternifolia* var. *integrifolia*, the smooth-shell varieties of the Queensland nut, are now being grown commercially in Hawaii and the industry shows considerable promise. The species is very variable and vegetative propagation from superior kinds selected from the plantations is advised. Apparently the rough and smooth shelled varieties will breed true to these characters though not to others. In grafting or budding it is advisable in the present absence of knowledge of stock effect to combine rough with rough and smooth with smooth; cross combinations can be made without difficulty, but the subsequent

\* *Camphora officinarum* Nees. *Laurus Camphora* Linn.



effect on yield and longevity remains to be discovered. The stock seed is germinated in sand boxes and the larger seeds, it should be noted, do not necessarily produce stronger seedlings and have the disadvantage to the purchaser over small and medium seed of running fewer to the pound or bushel. Seedling stocks are transplanted to nursery beds when 4-6 inches high and the tap root cut back to 6 or 7 inches. The practice of transplanting to cans or pots leads to permanently deformed roots and delayed growth. Light dressings of ammonium sulphate or sodium nitrate are given at 2-month intervals starting 3-6 weeks after transplanting and stopping 2-3 months before grafting. Irrigation should cease 4-6 weeks before grafting. The most successful grafting method with *Macadamia* has proved to be the side wedge, in which a scion of 3 nodes and of similar diameter to the stock, its basal end trimmed to a wedge, is inserted into a cut made in the side of the stock; it is then secured by the usual tying and waxing. This graft has also been found very suitable in topworking older trees, the union being made on the year-old shoots which have grown from the previously cut back trunk or branches of the tree to be worked. Patch budding can be practised on nursery stocks but with more difficulty. Instructions are given for the after treatment of grafted plants.

875. THOMPSON, A.

634.6-2.4

**Observations on stem-rot of the oil palm.***Sci. Ser. Dep. Agric. S. S. and F. M. S.* 21, 1937, pp. 27, bibl. 9.

Stem-rot disease (*Fomes noxius*) was studied in Malaya on 720 oil palms. The development of the disease is described. The death of oil palms was rarely found to occur earlier than 2-3 years after infection. Although the disease may also occur on other soils, it is said to be only serious in areas of deep peat or in quartzite valley soils with sand beds approaching the surface. Control measures are discussed, and it is shown that palms killed by *F. noxius* may be buried in the ground since this fungus does not attack the roots. Palms, however, that have been killed by stem rot caused by *Ganoderma lucidum* or *Ustilina zonata* should not be buried, as these fungi may cause root infection. In palms affected by stem-rot, treatment by excision of decayed tissue is only recommended for deep peat areas, where economic yields are still obtainable and where, if the diseased palms were felled and supplies planted, growth of the supplied palms is unlikely to be satisfactory. "Hat-peg" pruning, in which the leaves are pruned slightly higher than usual so as to leave a fairly long portion of petiole attached to the stem, reduces wounding and appears to give a measure of protection. A short account is given of *Ganoderma lucidum* and *Fomes lignosus* on oil palms. Of these fungi the first named is regarded as a facultative parasite while *F. lignosus* is said to be saprophytic on oil palms.

876. CEYLON DEPARTMENT OF AGRICULTURE.

631.543.83 : 634.61

**Useful live fence-posts for coconut areas.***Leaflet. Dep. Agric. Ceylon* 94, 1937, p. 1.

The use of *Azadirachta indica*, *Calophyllum Inophyllum*, *Ceiba pentandra*, *Gliricidia sepium* (= *G. maculata*), *Leucaena glauca*, and *Thespesia populnea* as live fence-posts is recommended for coconut areas in place of split and tarred sections of coconut stems or coconut logs, which are likely after a time to provide suitable breeding places for the coconut black beetle grub.

877. CRAWFORD, C. L.

634.62 : 581.162.3

**Effectiveness of date pollen following cold storage.***Proc. Amer. Soc. hort. Sci. for 1937*, 1938, 35 : 91-5, bibl. 8.

Experiments were carried out at the United States Experimental Date Garden in 1935, 1936 and 1937 to test the result of storing date pollen at room temperature and in cold store at approximately 8° F. on its efficacy. Pollen of *Phoenix dactylifera* collected in 1935 and in 1936 and kept for 1 year at room temperature was useless commercially under field conditions, where fresh pollen gave a normal set. Pollen held for 1 year in cold storage gave rise to a slightly lower set of fruit than did fresh pollen. It did, however, give a 58% set of fruit which would normally suffice for a good commercial crop.

878. CEYLON DEPARTMENT OF AGRICULTURE.

634.774

**Pineapple cultivation.***Leaft. Dep. Agric. Ceylon* **107**, 1937, pp. 3.

Brief information is given on the essentials of pineapple cultivation. Vegetative propagation by means of ratoons, suckers, crowns, crown slips, and fruit stalk slips is discussed. Reference, but no further mention, is made of other more specialized methods of propagation. In addition to the notes on planting, fruiting seasons, yields, manuring, etc., the use of pineapples as catch crops is discussed.

879. LEWCOCK, H. K.

634.774 : 547.314.2 : 581.145.1

**The use of acetylene to induce flowering in pineapple plants.***Qd agric. J.*, 1937, **48** : 532-43.

As a result of trials carried out in recent years in Queensland and Hawaii it was found that acetylene gas is just as effective as ethylene in inducing flowering in pineapples and that it is both cheaper and more convenient to use. The treatment, in which acetylene gas is applied in water solutions, has not been found to exert any adverse effect either on the plant itself, its sucker growth or the quality of the fruit. The method of application is described in some detail and illustrations are given.

880. SIDERIS, C. P., AND KRAUSS, B. H.

634.774 : 581.084.2

**The growth of pineapple plants in complete water cultures with either ammonia or nitrate salts.**Reprinted from *Growth*, September 1937, pp. 204-10, bibl. 7.

In 1936, studies were made of the growth of pineapple (*Ananas comosus* Merr.) in water cultures. Two sets of plants were employed, one with ammonium and the other with nitrate as sources of nitrogen. The plants were obtained vegetatively from slips, which had been cured for 14 days in the greenhouse. Graphs and tables are given. The following notes are taken from the summary :—The growth of pineapple plants in complete nutrient solutions followed the curve of an autocatalytic monomolecular reaction. The divergences between observed and calculated weight values of the first 3 periods were great on account of the readjustment of the plants to their environment. The weight values of the plants of the ammonium series were approximately of the same magnitude as those of the nitrate series, indicating that both forms of nitrogen were equally effective in promoting plant growth when the pH was maintained at  $5.0 \pm 0.4$ .

881. SAKIMURA, K.

634.774-2.73

**A survey of host ranges of thrips in and around Hawaiian pineapple fields.***Tech. Pap. Pineapple Exp. Sta. Univ. Hawaii*, **102**, December 1936, pp. 415-27, bibl. 22.

The host ranges of thrips are recorded and their possible relation to the vector of the yellow spot virus in Hawaii is discussed.

882. RODRIGO, P. A., URBANES, P. S., AND OLAN, V. R.

635.34

**Variety tests of cabbage.***Philipp. J. Agric.*, 1938, **9** : 1-30, bibl. 4.

The cultivation of cabbage at sea level in the Philippines is discussed. Variety trials of about 33 kinds of well-known European and American varieties have been in progress at several stations for about 5 years, the average yields ranging from 178 to 23,239 kg. per hectare. Fifteen varieties gave average yields ranging from 14,827 to 23,239 kg. The 6 heaviest yields were obtained with Special Succession, Succession, Late Flat Dutch, Allhead Early, Allhead Select, Charleston Wakefield, none of which averaged less than 14,000 kg. per hectare, but others ran them close. There was a considerable range in yield for any one variety between the various stations but conditions were not equal. There were also often considerable differences in yield at each of the stations for any one variety between season and season. The number of days needed to reach maturity from sowing was 80-109. The usual soils were shallow loams overlying adobe soil.

883. GUTIERREZ, M. E. 635.34  
**Progress report of cabbage experiments at Baguio, Mountain Province.**  
*Philipp. J. Agric.*, 1938, 9 : 79-102.  
ELAYDA, A. 635.34  
**Commercial raising of cabbage.**  
*Philipp. J. Agric.*, 1938, 9 : 103-15, bibl. 7.

The first paper deals with various experiments with cabbages in the highlands of the Philippines where their cultivation is well established. The second paper is a farmers' bulletin giving general instructions for cultivation of cabbage in the Philippines.

#### STORAGE.\*

884. EAVES, C. A. 664.85.11.035.1  
**Physiology of apples in artificial atmospheres.**  
*Sci. Agric.*, 1938, 18 : 315-38, bibl. 37.

In experiments lasting 5 days, low (6.2%) and high (53.5%) concentrations of CO<sub>2</sub> stimulated and depressed respectively the total CO<sub>2</sub> output of apples. Low concentrations of O<sub>2</sub> (1%) increased the output of CO<sub>2</sub>. When returned to air the rate of oxygen uptake was found to be lower than in those fruits stored continuously in air. Fruits stored in 5% and 10% CO<sub>2</sub> at 3.5° C. for several months and removed to 21° C. were observed to respire more rapidly than control fruits stored in air.

885. LUTZ, J. M., AND CULPEPPER, C. W. 581.192 : 634.13 + 664.85.13  
**Certain chemical and physical changes produced in Kieffer pears during ripening and storage.**

*Tech. Bull. U. S. Dep. Agric.* 590, 1937, pp. 37, bibl. 52.

The optimum dessert and canning quality of the Kieffer pear was studied for several years. Some of the results obtained are presented here. The most rapid ripening and optimum quality of Kieffer pears were attained at 55°-65° F. Loss in weight and deterioration of fruit increased with temperatures above 65° F. The higher quality of Kieffer pears that had been ripened at 60°-65° F. was not associated with the content of solids, sugars or acids. Retardation in ripening at high temperatures could not be attributed to abnormal accumulation of alcohol or acetaldehyde in the pear tissue nor to an accumulation around the fruit of esters or other volatile constituents given off by the pears. Accumulation of carbon dioxide in the fruit was stated not to be the primary cause of the retardation. Rate of softening was found to be closely associated with conversion of protopectin to pectin. Both of these changes were most rapid at 60° F. and decreased with higher and lower temperatures. Increase in rate of respiration at 60-65° F. during ripening was found to be closely associated with the more rapid softening at this temperature. At 90° F. there was practically no softening and the rate of respiration decreased markedly during the ripening period. Catalase activity in pears held at 60° F. was generally higher than that in pears held at temperatures above this. The depressing effect of temperatures as low as 70° and 80° on the activity of catalase and the pectic enzymes in Kieffer pears is said to refute the general opinion that optimum enzymatic activity usually occurs at higher temperatures. A uniform temperature of 60° F. proved superior to alternating temperatures of 50° and 70°. A marked retardation was caused when, after a partial ripening at 60°, the pears were transferred to a higher temperature. The harmful effect of an exposure of 2 weeks at 80° was evident even after removal to 60°. Kieffers stored for a prolonged period at 32° F. failed to ripen properly when removed from storage. At the same time a decrease in catalase activity and abnormal respiration after removal from storage in the later stages was observed. However, loss in quality, which occurred before the time the fruit failed to ripen properly, limited the storage life to about 90 days. Ethylene failed to hasten the ripening of Kieffer pears

\* See also 726.



at 80° F. There was a marked decrease in alcohol-insoluble constituents, a slight decrease in firmness, a slight increase in sugar content and generally a slight decrease in acidity as the pears ripened on the tree. The time of harvesting had but a slight effect on pear quality. More significant was the influence of ripening temperature after harvest. Quality and sugar content were generally found only slightly influenced by the number of leaves per fruit, but severe defoliation resulted in low sugar content and only mediocre quality. The quantity of stone cells in the properly ripened pears was found to be less than in the unripened pears, but neither chemical analysis nor microscopical examination revealed any decrease in their amount during ripening. It is indicated that the decrease is due to the increased ease with which the clusters of stone cells are broken up into smaller aggregates as the pears ripen.

886. PUTTERILL, V. A. 664.85.22 : 547.314.2

**Effect of acetylene on the ripening of Kelsey plums.**

*Nature*, 1938, 141 : 875-6.

The striking results obtained in the ripening of Kelsey (Japanese) plums during storage in South Africa by treatment with acetylene is recorded. The plums which are normally very difficult to ripen after picking, became fully ripe from green, or green with red trace, in 5 days after submission for 24 hours at 70° F. to an atmosphere containing 1% of acetylene. The uniformity of the ripening was in marked contrast to the irregular ripening of the untreated fruit. The fruit used was picked in the latter part of the season. Fruit picked earlier and stored at about 70° F. for 4 weeks was much slower in reaction when finally submitted to treatment. Unripe Kelsey plums were also ripened at the same rate by enclosure in a container with naturally ripened fruits.

887. LUTZ, J. M. 664.85.877

**Factors influencing the quality of American grapes in storage.**

*Tech. Bull. U. S. Dep. Agric.* 606, 1938, pp. 27, bibl. 20.

For several years American grape varieties from Maryland, Virginia and North Carolina were studied at the cold-storage laboratory, Experiment Farm, Arlington, Va. The following notes are taken from the author's summary:—The amount of shattering (dropping of berries from the pedicel) and decay of grapes in storage was least at 32° F. Shattering became especially marked near the end of the storage period, while decay seemed to develop more or less uniformly throughout the storage period. A relative humidity of 80-85% seems to be most desirable for grapes, higher relative humidities causing more shattering and decay and lower humidities resulting in a more serious shrivelling. Delayed storage adversely influenced the storage life of grapes in proportion to the amount of delay. Careful handling and removal of cracked berries at time of storage improved the keeping quality. 22, 29 and 39 hours respectively were required to cool the centres of 4-quart, 16-quart and bushel baskets of grapes from 70° F. to storage room temperature (31° F.). There was usually more deterioration of grapes in the larger size baskets. For the storage of the varieties tested, baskets of 12-quart size or less are recommended. Washing the grapes resulted in a slight increase of decay during storage. The use of sodium bisulphite caused some reduction in the percentage of decay and shattering. Loss of weight was correlated directly with temperature and inversely with relative humidity. Grapes removed from cold storage while still in good condition did not develop appreciably more mould or shattering in 3 days at 70° F. than similar fruit not stored. Comparative data are given of storage qualities of 84 varieties of labrusca type grapes and 6 varieties of muscadine grapes. The respiration of Concord grapes increased from 2.74 mg. of carbon dioxide per kg./hour at 32° F. to 38.55 mg. at 80° F. The refractometer proved to be a satisfactory means of obtaining a close approximation of the sugar content of grape juice. The most significant effect of storage upon the chemical composition of grapes is a loss in acidity with corresponding loss in sprightliness in flavour at high temperatures. There was a slight increase of solids and acids at low temperatures, apparently due to loss of water. Solids content in grapes increased and acid content decreased during maturation on the vine. The solids/acid ratio was almost doubled in a period of 19 days.

888. WRIGHT, R. C. 632.111 : 635.9 + 664.84/5  
**The freezing temperatures of some fruits, vegetables and florists' stocks.**  
*Circ. U. S. Dep. agric.* **447**, 1937, pp. 10, bibl. in text.

The bulletin gives the freezing points, i.e. temperatures at which actual ice formation takes place, of 34 commercial kinds of fruits, 45 vegetables, 15 cut flowers, 8 bulbs and 10 varieties of florists' foliage. It is pointed out that these figures should simply be regarded as danger points, since there is great varietal difference and even differences between individuals of the same variety. Some for instance can be cooled well below their freezing point and be thawed without injury, while others (tomatoes, bananas, etc.) suffer chilling injury many degrees above their freezing point. The information is essential for those engaged in commercial cold storage.

889. BROWN, W. B. 664.85.047  
**The changes of moisture content of dried fruit during storage.**  
*J. Soc. chem. Ind.*, 1938, **57** : 31-6.

A procedure for the determination of moisture content of dried fruit is described. A description is given of the inexpensive form of vacuum oven used. Results are given showing the equilibrium values of moisture content of dried fruit and atmospheric humidity at 2 temperatures. The changes of moisture content during an experimental bulk storage of fruit are described. [Author's summary.]

890. ALLEN, F. W. 664.85.035.1  
**Carbon dioxide storage of apples, pears, plums and peaches.**  
*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, **35** : 193-9, bibl. 9.

Yellow Newtown and Yellow Bellflower apples held up to 18 weeks in CO<sub>2</sub> concentration of 10% at 45° F. remained as green and firm as in 32-36° F. air. All internal browning was avoided (Yellow Bellflower is not subject). Similar results were obtained with Bartlett and Hardy pears, though over a much shorter period. A storage of 30 days in 15% CO<sub>2</sub> at 45° F. proved too long for Beauty, Santa Rosa, Wickson and President plums and for Elberta and J. H. Hale peaches. However, when held at 45° F. for 6-10 days at CO<sub>2</sub> concentrations of 20-80% the time required for ripening after storage was more than doubled. Pectin changes were fairly definitely correlated with the composition of the storage atmosphere, but sugar and acid changes were not.

891. THORNTON, N. C. 664.84.31.035.1 : 577.16  
**Carbon dioxide storage. X. The effect of carbon dioxide on the ascorbic acid content, respiration, and pH of asparagus tissue.**  
*Contr. Boyce-Thompson Inst.*, 1937, **9** : 137-48.

The ascorbic acid content of asparagus tissue was reduced by 8 to 52% with storage in an atmosphere containing carbon dioxide. The loss of ascorbic acid was most rapid during the early hours of exposure to carbon dioxide and it occurred either during or following storage at all temperatures from 2° to 27° C. The loss of ascorbic acid was the greatest in the bud tissue, but it also took place in the stalk. After the loss of ascorbic acid during storage in CO<sub>2</sub> no recovery occurred when the tissue was exposed to the air after treatment. The rate of respiration of the asparagus tissue was also reduced during exposure to the CO<sub>2</sub> gas. The hydrogen-ion concentration of asparagus tissue was decreased during the period of treatment with CO<sub>2</sub>. This manifested itself by an increase of 0.4 to 0.9 of a pH during treatment. The acidity returned to the original values on removal of tissue to air. [Author's summary.]

892. THORNTON, N. C. 577.16 : 664.85.035.1 + 664.84.035.1  
**Carbon dioxide storage. XI. The effect of carbon dioxide on the ascorbic acid (vitamin C) content of some fruits and vegetables.**  
*Proc. Amer. Soc. hort. Sci. for 1937*, 1938, **35** : 200-1, bibl. 1.

Bananas held in various concentrations of CO<sub>2</sub> for various periods suffered a reduction of ascorbic acid if green but not if yellow. At any stage the removal of bananas from storage resulted in a rapid recovery of the ascorbic acid content to a level approximating to that of untreated fruit

at the same stage of maturity. Similar treatment of apples resulted in no change. Asparagus lost 50-60% in a very short time and continued to lose it even in an atmosphere relatively free from CO<sub>2</sub>. Green Mountain potatoes lost 16-40% of their ascorbic acid content when exposed to 30-60% CO<sub>2</sub> at 25° C. for the first 15 days after harvest. When treatment was given first 150 days after harvest, by which time the ascorbic acid content had shrunk from 25 mg. per 100 grams of tissue to 7 mg., CO<sub>2</sub> had no detectable effect. Peas suffered a 10% reduction and string beans were unaffected after 24-48 hours.

893. SMOCK, R. M., AND ALLEN, F. W. 664.85.035.1 : 581.192

**Soluble pectin changes in gas stored fruit.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 184-7, bibl. 6.*

Normal soluble pectin increases in Elberta peaches, Bartlett and Hardy pears and Yellow Newtown apples are retarded by carbon dioxide storage at 45° F. In varieties of fruit which have a considerable amount of soluble pectin, the determination of the change from pectose to pectin is judged to be a good criterion of the rate of softening. In one lot of Bartlett pears and in a test with Hardy pears there was some indication of a residual effect of the gas storage treatment during the ripening period.

894. WINTER, J. D., LANDON, R. H., VOGELE, A. C., AND ALDERMAN, W. H.

664.85.711.035.1 + 664.85.75.035.1

**The carbon dioxide treatment of raspberries and strawberries.**

*Proc. Amer. Soc. hort. Sci. for 1937, 1938, 35 : 188-92, bibl. 1.*

Treatment of freshly picked berries of raspberries and strawberries with carbon dioxide at initial concentrations of 45% for from 3 to 20 hours resulted in improved shipping quality and reduced spoilage and increased the time that such fruit could be held in marketable condition.

895. WARDLAW, C. W., LEONARD, E. R., AND BAKER, R. E. D. 664.85.3.021

and

664.85 : 632.4

**Antiseptic and other treatments in the storage of Trinidad citrus fruits.**

*Mem. I. C. T. A. Trin.*, 5, 1937, pp. 27, bibl. 24, price 2s. 6d.

Experiments are detailed which show that the employment of antiseptic washes for citrus fruits, such as is the custom in most producing countries, as a protection against *Penicillium* rots, is inadvisable in Trinidad. Boric acid dip failed to control *P. digitatum* and considerably increased wastage by *Botryodiplodia Theobromae* and *Colletotrichum gloeosporioides*, both of which are associated with stem-end rot. Rapid storage at a low temperature (45° F.) markedly delayed the incidence of decay which, however, set in immediately on removal to 60° F. Over the whole range of treatment in the experiments described borax increased fungal wastage in cold storage 4 times and increased blemishing 20 times with a concomitant increase in fungal wastage at higher temperatures later. A brief comparison is made with the findings of workers in other countries and probable reasons for their apparently favourable results with borax are suggested. Experiments with iodized wraps have given contradictory results in Trinidad and England. These may be reconciled by the following considerations :—When the pathogen is still superficial, as in freshly picked or freshly inoculated fruit, iodine vapour controls fungal activity by curtailing spore germination and hyphal growth, whereas when the time of picking and wrapping permits of hyphal penetration into the tissues or where latent infections are present, the effect of iodine vapour is to induce a loss of resistance to fungal exploitation. The conclusion that the time of application of iodized wraps is of fundamental importance is supported by the results of experiments made by the authors in which some control was obtained when the wraps were applied immediately while delayed application resulted in increased rotting, so that where, as in Trinidad, 3-4 days elapse between picking and packing, iodized wraps should on no account be employed. Waxing as practised in the local packing shed was definitely beneficial in reducing loss of weight and skin blemishing. An appendix by Baker provides mycological notes on citrus wastage.



896. SAMARSKY, A. I. 577.16 : 634.3  
**Vitamin C content in citrus fruits.** [Russian, English summary 8 lines.]  
*Soviet Subtropics*, 1938, No. 4 (44), pp. 17-20.

In January 1936, analyses were made at the Sochi Experiment Station of citrus fruits obtained from different parts of the humid subtropics. The following conclusions were reached:—Vitamin C content was found to vary considerably in the different species and varieties of the fruit as well as in fruits of individual plants within a variety. It decreased in inverse proportion to ripening and to increase in size of the fruit. The loss of vitamin C content due to storage and to preservation by cooking was much smaller in citrus fruits than in any other fresh products of plant origin. The ability to preserve vitamin C content during storage was not found to be the same in different fruits, thus the Unshiu tangerine lost 60% of its vitamin C content after 5 months' storage, whereas no loss occurred during the same period of storage in the Turkey orange.

897. WARDLAW, C. W., AND LEONARD, E. R. 634.651 : 581.192 : 664.85.651.035.1  
**Studies in tropical fruits. III.\* Preliminary observations on pneumatic pressures in fruits.**  
*Ann. Bot. Lond.*, 1938, 2 : 301-15, bibl. 5.

Further observations are made with reference to the changes in the internal concentrations of carbon dioxide and oxygen during the development, ripening and senescence of the papaw. By fitting manometers to the cavities of papaws during development and ripening it has been shown (i) that immature developing fruits at normal air temperatures are characterized by a negative pressure; (ii) that full-grown green fruits are characterized by a small positive pressure; (iii) that as ripening proceeds there is a progressive decrease in this positive pressure until, in senescent yellow fruits, a definite negative pressure is produced; and (iv) in final senescence there is a recovery towards atmospheric pressure. In the papaw fruit transitions from negative to positive pressure, and vice versa, coincide almost exactly with those stages in development and ripening respectively at which the sum of internal carbon dioxide and oxygen concentrations rises to and falls from approximately 21%. The results obtained lend support to views previously expressed that during development, ripening and senescence, the tissues of fleshy fruits offer a changing resistance to the movement of gases. Reasons are advanced in support of the view that the manometer record, being the resultant of the several gaseous phenomena involved in metabolism, is of considerable value in the study of respiration. [From authors' summary.]

898. NIEDERL, J. B., BRENNER, M. W., AND KELLEY, J. N. 547.313.2 : 664.85.771  
**The identification and estimation of ethylene in the volatile products of ripening bananas.**  
*Amer. J. Bot.*, 1938, 25 : 357-61, bibl. 43.

Conclusive qualitative evidence of the evolution of ethylene by bananas during ripening was obtained by converting the ethylene to acetylene and determining the latter as silver acetylide. A method was devised for securing semi-quantitative estimation of ethylene present in small traces in air and an efficient absorption unit was designed for use in this work. The amount of ethylene given off by bananas is approximately 0.1 to 0.2 ml. per 100 lb. of fruit during the ripening period. [Authors' summary.]

899. KALSHOVEN, L. G. S. 632.7 : 664.84 + 664.85  
 Invloed van insecten op de kwaliteit en verhandelbaarheid van indische landbouwproducten. (The quality and marketability of East Indian agricultural products as affected by insects.)  
*Korte Meded. Inst. PlZiekt. Buitenz.* 24, 1938, pp. 48, bibl. 3 pp.

The author first discusses the different types of damage done by insects to different parts of living plants of commercial value in the Dutch East Indies, dealing with the damage done to

\* I and II. *Ibidem*, 1936, 50 : 621-53, 655-76; also issued as *Mem. Low Temp. Res. Sta., Trin.*, No. 4. *H.A.*, 7 : 235.

leaves, to fruit and seeds and to stems and its effect on the finished product. The greater part of his article is, however, devoted to a consideration of storage pests. They are dealt with under their crop headings, which are :—areca nuts, cassava, cacao, cinchona bark, coca, coffee, copra, derris root, ground nuts, ground nuts and coconut cakes, Illipé nuts, kapok, mace, maize, musk seed (*Abelmoschus*), nutmeg, peas and beans, pepper, potatoes and sweet potatoes, rattan, rice, rubber, sugar, tea, sesamum, timber and tobacco.

### PROCESSING, PLANT PRODUCTS.

900. TODHUNTER, E. N. 641 : 634.11  
**The nutritive value of apples.**

*Pop. Bull. Wash. agric. Exp. Sta.* 152, 1937, pp. 32, bibl. 122.

In this bulletin the composition, vitamin value and therapeutic uses of apples are described. Tables are given showing (1) the daily requirement of Washington grown apples as a sole source of vitamin C to protect a man from scurvy ; (2) ascorbic acid content of apples ; (3) vitamin units in apples of different varieties ; (4) uronic acid value of some apple varieties and other fruits ; (5) composition of apple powder ; (6) average composition of apples, classified as early, medium, and late ripening ; and (7) average composition of canned apple sauce. All available articles published in English referring to the nutritive value of apples, and selected references from foreign literature have been included in the bibliography.

901. FAWNS, H. T., AND MARTIN, E. J. 663.813  
**The chemical composition of fresh apple juice.**  
*J. Soc. chem. Ind.*, 1938, 57 : 60-5, bibl. 27.

Analyses of 9 apple juice varieties are given together with figures obtained by other investigators. Comparison of these data with analyses of whole apples demonstrates that the major constituents of nutritional importance pass into the juice. The analytical methods employed have been discussed and preliminary methods for the evaluation of commercial samples have been suggested as a possible basis for further developments. [Authors' summary.]

902. CELMER, R. F., AND CRUESS, W. V. 663.813  
**Canning of apple juice.**  
*Better Fruit*, 1937, 32 : 5 : 5.

Several processes for canning apple juice recently subjected to investigation are discussed and the process giving the best all round results with apples of pronounced flavour, aroma and tartness is described. The apples particularly noticed in this paper are Gravenstein, Winesap, Northern Spy, Stayman and Jonathan. The paper contains much information of value especially to those who, while familiar with canning processes, have not had much experience with this particular fruit.

903. CHARLEY, V. L. S. 663.813  
**Recent developments in fruit products research at Long Ashton.**  
*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938*, pp. 231-42.

The author outlines the progress made at Long Ashton in the production of the following fruit products :—apple juice, fruit concentrates, fruit syrups, fruit squashes, fruit wines, cider vinegar, cider brandy and commercial spirit.

904. CHARLEY, V. L. S. 663.813  
**Investigations on fruit products. XI. Experiments in fruit syrup production.**  
*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938*, pp. 170-85, bibl. 5.

The author deals with the three following aspects of the subject :—A. Method of extraction and preservation of fruit juices for syrup making. B. Effect of sugar concentration on retention of flavour in syrups. C. Preservation of syrups by heat and chemical treatments. He summarizes his experiments as follows :—"1. Juices were obtained from strawberries, loganberries,

black currants, cherries and blackberries by four methods: immediate milling and pressing; enzyme action; slight fermentation; and heating the milled fruit at 160° F. for half an hour. The enzyme and fermentation treatments afforded the highest yields of juice and were most helpful in further processing. The heat treatment yielded very thick juices which were extremely difficult to clarify. With regard to flavour, the juice obtained by immediate milling and pressing was very deficient in flavour, and in general, the enzyme treatment produced the most attractive products. Heat treatment did not result in appreciable deterioration of the flavours with the exception of strawberry where a 'cooked' taste was noticeable.

2. Filtered fruit juices were stabilized in four different ways for a long period and then converted into syrups. The methods were:—cold sterilization (Seitz E.K. filtered); pulp filtration and pasteurization at 165° F. for half an hour; pulp filtration and 200 p.p.m. SO<sub>2</sub>; clarification plus 200 p.p.m. SO<sub>2</sub>, and the acidity raised to 5% citric acid. After 12 months, strawberry and cherry flavours had disappeared, but loganberry and raspberry characters still persisted in satisfactory intensity.

3. In experiments where the sugar concentration of syrups was varied, the retention of true fruit flavour increased as the sugar concentration was raised. Strawberry syrups with 30% sugar were particularly liable to lose their fruit character, but similar loganberry syrups remained much fresher in flavour after storage.

4. SO<sub>2</sub> and benzoic acid were compared as preservatives for various types of fruit syrups. The former proved more efficient. Despite initial improvement in the flavour of strawberry syrups preserved with benzoic acid in comparison with those treated with SO<sub>2</sub> the former gradually lost their freshness and acquired a full, but rather flat character. Raspberry, loganberry and black currant syrups, preserved with benzoic acid retained a full fresh flavour during storage. Hydroxybenzoic esters were generally inefficient at a strength of 10 p.p.m. Pasteurization of syrups at 165° F. for half an hour gave perfect freedom from fermentation, but caused a definite alteration in flavour."

905. CHARLEY, V. L. S., CURTIS, R. C., AND SILLS, V. E. 663.813  
**Investigations on fruit products. XII. Chemical constituents of fresh juices from single varieties of soft fruits and the suitability of the juices for syrup manufacture. Progress report II.**

*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938, pp. 186-90.*

Investigations reported a year ago have been continued. In the present paper further notes are given on the analysis of single variety fruit juices. Values were obtained similar to those for 1936 with the exception of the ascorbic acid content for black currants, which showed a considerable increase on previous figures. Results with particular varieties are discussed. It may be noted that the gooseberry syrups all lacked a definite fruit character.

906. CHARLEY, V. L. S. 663.813  
**Investigations on fruit products. XIII. The commercial production of fruit syrups—season 1937.**

*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938, pp. 191-4.*

It was found in previous experiments that even slight fermentation of the fruit often resulted in lack of flavour in the juice. Hence attempts have been made to determine how to prevent this by the addition of SO<sub>2</sub> to the fruit before transport to the juice factory. In strawberries the addition of 100 p.p.m. SO<sub>2</sub> sufficed to stop fermentation but raspberries sent in cwt. tubs from Scotland to Bristol needed 600 p.p.m. SO<sub>2</sub> to stop yeast action.

907. CHARLEY, V. L. S. 663.813  
**Investigations on fruit products. XIV. Experiments on the production of unfermented apple juice, 1934-38.**

*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938, pp. 195-230, bibl. 2.*

The author summarizes his experiments as follows:—1. "Unfermented apple juices were prepared by pasteurization and cold sterilizing filtration methods. Perfect stability was



obtained with juices of medium acidity by pasteurizing at 160° F. for 30 minutes. The cold process gave very erratic results, and this was shown to be due to factors other than the sterilizing filter. The difficulties of obtaining completely sterile conditions during bottling are indicated. The differences in flavour between the two types of juice were as follows :—The hot treatment gave drinks with full flavours, in which varying degrees of 'cooked' taste were noticeable, whilst the cold process produced beverages with remarkably fresh and clean aromas and flavour, but rather lacking in 'body'. Pasteurization at relatively low temperatures was shown to be more effective in sterilizing the more acid juices, but the bad effect of pasteurization on flavour increased with the acidity of the juice. The bulk storage of apple juice in treated wooden or metallic vessels was examined. The results were variable, but in general wood was not satisfactory for long-term storage. Stainless steel lacquered steel casks provided satisfactory storage conditions.

2. The production of an unfermented drink from apples, which could be stored in the bottle or can in which it would be finally marketed, was investigated. The scheme for processing which gave the best results is as follows :—Milling and pressing the fruit; de-aeration of juice under 29 in. vacuum; flash pasteurization at 185°-190° F. for 30 seconds; maceration of cooled juice with 40 lb. press-cake per 100 gallons juice; removal of macerate; treatment with 0.1% pectin-decomposing enzyme for 48 hours; adjustment to predetermined specific gravity and acidity; filtration of juice to brilliant condition; de-aeration and pasteurization as before; cool to 140° F.; can juice at 140° F. to sterilize containers; allow to cool naturally. Perfect stability with regard to fermentation has been achieved by this method, but a slight haze formed after 2 months' incubation at 25° C. Plain cans were shown to be useless, but wax-lined, lacquered cans were quite suitable. Results in the bottle were more variable than with cans, and when they are used juices should be filled into them at approximately 150°-155° F. This temperature will probably vary with the type of bottle. Attractive beverages were produced from Bramley's Seedling juice alone by the above method."

908. CHARLEY, V. L. S.

663.3

**Notes on cider-making practices in Europe (1925-37).**

*Annu. Rep. Long Ashton Res. Sta. for 1937, 1938, pp. 160-9.*

The notes made here were compiled from technical reports prepared as the result of a number of visits to cider making centres in France and Germany and Switzerland on different occasions in recent years. *Fruit.* In Germany and Switzerland there is not the same clear differentiation between the true cider and the culinary types of apple and the cider produced is therefore less heavy but more acid than that produced in France. *Storage of fruit.* In France was seen the most elaborate system for obtaining requisite maturity in large bulks of fruit. *Washing of fruit.* Great attention was paid to this in all three countries, various methods being used. *Milling.* Notes are given of a new type of mill used in Switzerland and of the French *râpe Bidon* which mills the fruit much more finely than is desired by English cider makers. *Maceration.* Maceration has been largely dropped in Germany and Switzerland as in England, but it is still considered most important in France and notes on the reasons for the French attitude are given. *Pressing.* There is considerable difference in the types of press used in each country. *Keiving.* This, like maceration, is peculiar to France. The processes and practical considerations involved are discussed. *Fermentation.* The increasing use noted in France in 1937 of low temperatures for preventing or controlling fermentation is significant. The extensive use of pure yeast cultures for fermentation of apple juice in Germany is noted as also the fact that German ciders are remarkable for their fine aroma and bouquet. *Filtration.* A brilliant finish is demanded in Germany and in France, too, the demand for adequate filtration is increasing. Notes are given of the German Seitz filter and of the 4-section French pulp filters. *Naturally sweet cider.* The blending of unfermented apple juice and what amounts to a fully fermented cider is practised in France to produce a very palatable sweet cider. *Champagne cider.* Notes are given on the successful Charmat process for the production of sparkling cider. *Storage vats.* Glass or bitumen lined vats are now universally used on the Continent for cider storage. The lining

materials generally used are:—in Switzerland “Ebon”, in France “Etanchis” and “Mamut Ventur”, and in Germany “Mamut Ventur”.

909. ADAM, W. B., AND HORNER, G. 546.811 : 664.85.036.5 + 664.84.036.5  
**The tin content of English canned fruits and vegetables.**

Reprinted from *J. Soc. Chem. Ind.*, 1937, 56 : 329T-34T, bibl. 11.

Figures are given to show the existing position with regard to tin content in canned fruits and vegetables and the value of improvements in lacquering which have been made or are in progress. The effect of factors such as temperature and time of storage, type of lacquer used, state of ripeness, and hydrogen-ion concentration is given and it is seen that fruits and vegetables in lacquered cans even after long storage seldom contain more than 40 mg. of tin per kg., only half of which is soluble. It is accepted in canning practice that the recognized maximum of tin in canned foods is 2 grains per pound.

910. WIDMER, A. 547.458.88 : 581.192  
**Die Pektinstoffe, ihre Darstellung, Eigenschaften und Anwendungsgebiete.**  
**(The production, properties and the use of the pectins.)**

*Schweiz. Z. Obst- u. Weinb.*, 1937, 47 : 48-50, 72-4 and 85-7.

Pectins are obtained from hydrolisation of protopectin by either (i) soaking in warm or boiling water, or (ii) by soaking in water at 100° C. under action of pressure, or (iii) by soaking in water that has been made slightly acid with hydrochloric, tartaric or lactic acids. The method of extraction used largely depends on the raw material at hand, residues from stone fruits, berries and pears being altogether unsuitable for pectin production. Apples provide the best material for pectin extraction. The properties of pectins and their various uses in different industries are discussed. Sections are cited from the different chapters of *Die Pektinstoffe, Einführung mit besonderem Hinblick auf die Obstkonservenindustrie* by Dr. R. Ripa (Dr. Serger and Hempel, Brunswick, 2nd edition), which is considered by the author an excellent book on pectins.

911. CULPEPPER, C. W., AND MOON, H. H. 664.85.13.047  
**Factors affecting the rate of drying of Kieffer pears.**

*Tech. Bull. U.S. Dep. Agric.* 592, 1937, pp. 30. bibl. 13.

A study has been made by the United States Department of Agriculture of the rate of drying of Kieffer pears during the entire drying process in atmospheres of different temperatures and relative humidities, and moving at different velocities. The results are tabulated. The following notes are taken from the summary:—The fruit dried rapidly at first, but gradually slowed down towards the end of the process. Increasing the temperature proved the most effective way of increasing the rate of drying. There was a great difference in the rate of drying of fruit in still air and in air moving at a relatively slow rate. Higher air velocities than about 0.5 m.p.h. over small quantities of material did not give a corresponding increase in the rate of drying, owing to certain limiting factors which are explained. The relative humidity affected the rate of drying in a somewhat similar way as the velocity of the air current. The solids in pear fruits are highly hygroscopic, and this characteristic is believed to minimize the effect of case hardening or the formation of an impervious layer at the surface. Almost any degree of subdivision of fruits may be used, provided that the proper drying conditions are employed, but fruit sliced into eight segments was found to be the most desirable for a number of reasons. Peeling the fruit is recommended because of the increased rate of drying and the improvement of the quality of the product. There was a small but significant difference in the rate of drying of the ripened and the unripened fruit. The drying rates for small and large fruits, which were determined on a small number of fruits stood nearly in proportion to the weight of the fruit.

912. WILBAUX, R. 633.74-1.56  
 Recherches préliminaires sur la préparation du cacao. (**Preliminary investigations on the preparation of cacao.**)

*Publ. Inst. nat. Étude agron. Congo belge, sér. tech.*, 15, 1937, pp. 71, bibl. 29.

Investigations were made into the methods of preparation of cacao beans. As a result of studies with several cacao varieties, which were carried out at Barambu (harvest 1935) and at Gazi (harvest 1936), the following conclusions were reached:—The quality of cacao chiefly depends on the variety, but ecological factors are also important. The quality of cacao beans can only slightly be improved by modifying the fermentation process. A warning is given not to ferment cacao for a definite fixed period of days, the rapidity of the fermentation process depending on so many factors. Methods for determining the end of the fermentation process are described. Care must be taken not to pick diseased cacao pods or unripe fruit.

913. KADEN, O. F. 633.74-1.56  
 Über das Aufbereiten des Konsumkakaos, insbesondere über das Gären, Waschen und Trocknen frühreifer und steinfrüchtiger Kakaobohnen. (**On the preparation of cocoa with special notes on the fermentation, washing and drying of "early-ripe" and "hard" cocoa-beans.**)

*Tropenpflanzer*, 1938, 4: 139-57 and 1938, 5: 193-203, bibl. 8.

In these papers trials of the preparation methods of cocoa-beans employed on the island of San Thomé, Portuguese West Africa and elsewhere are examined. It was found that 50% of the "early-ripe" and "hard" cocoa-beans may be eliminated during fermentation, if certain methods, which are described, are used. For solar drying the "secador de cavetas" (drawer dryer), is recommended, and of the artificial drying apparatus the hot air drum dryer is considered the best. Cocoa-beans should be washed prior to drying, thus reducing the percentage of inferior beans to below 5%. Other advantages obtained by washing the beans are mentioned. Information is given on the characteristics of the "early-ripe" and "hard" cocoa-beans and practical suggestions are made for planting certain hybrid types which may give improved fermentation.

914. KNAPP, A. W. [Editor]. 577.16: 633.74  
**Vitamin D in cacao shell. (Commercial cocoa bean shell.)**

*Bookl. Publ. Dep., Bournville, tech. ser.* 23/37, 1937, pp. 64, bibl. 57, 1s.

A collection of 7 publications on the properties and uses of cacao shell. Stress is laid on its value as an accessory cattle feed owing to its quite exceptional vitamin D content. Commercial cacao shell is the thin skin covering the bean and is separated from the lightly crushed bean by sieving and winnowing.

915. EGOROV, I. A. 663.952.4  
**Changes in the composition of black tea during storage.** [Russian, English summary 16 lines.]

*Soviet Subtropics*, 1938, No. 2 (42), pp. 91-5.

A tabulated account of the studies of changes in the composition of black tea under storage conducted by the Central Chemical and Technological Laboratory of Glavchay. A definite relationship, though differing with flushes of different origin and different quality, was found to exist between the moisture content of the tea and the relative humidity of the air. For Georgian teas a moisture content of 13% was determined as the maximum moisture content excluding mould development. The amount of extract substances in Georgian and Indian teas was found to decrease during storage. Changes in extract substances and in chlorophyll are stated to affect the intensity of colour in decoction. Changes occurring in volatile oils



comprise decomposition of complex ethers, accumulation of free volatile acids and a reduction of total oxidation capacity and of the amount of light fractions. Changes in composition of different constituents during storage are more intensive in teas with high moisture content, dependent on the relative humidity of the air.

### NOTES ON BOOKS AND REPORTS.\*

916. MERCER, S. P.

631.521 : 63

#### ***Farm and garden seeds.***

Crosby Lockwood & Son, London, 1938, pp. 205, 10s. 6d.~

The objects of this book as stated in the preface are to convey to the non-technical an outline of the system of reproduction in plants, to offer the agricultural student a syllabus of essentials to his seed studies and a skeleton guide to the professional business of seed testing and to indicate to the farmer the means available for cheap insurance of braird, which (to save the non-technical and possibly even the agricultural student a visit to the dictionary) means young shoots. Chapter 1 discusses the nature of a seed, its formation, structure and the biological processes of ripening and germination, with notes on longevity and vernalization. Chapter 2 deals with commercial seed production and particularly with the processes of storing, shipping and cleaning. The section on cleaning is particularly interesting because of the number of ingenious methods described, among which is the inspired and successful idea of a young lady, said to be quite strange to the seed business, for removing dodder seed, which is very slightly rough, from red clover seed which is smooth but otherwise of almost identical size and shape. The suggestion was to sprinkle the whole bulk with a magnetic powder, shake it free again and pass it in a slow stream under a magnet. Not only the dodder seed but all other rough impurities retaining traces of the powder, including cracked or broken clover seed, fly to the magnet while the good smooth clover seed passes on. Chapter 3 is concerned with seed testing and after a preliminary discussion in which it is pointed out there that the seed testing stations have to cater for two not always compatible interests, that of international trade and that of the husbandman, the technique employed is fully dealt with. Chapter 4 contains brief descriptions and drawings of the most important crop seeds in use in the U.K. and of a selection of weed seeds most frequently found in them. Chapter 5 is by A. W. Monro, late Principal in charge of the Commercial and Seeds Branch of the Ministry of Agriculture and consists of an account of the provisions and administration of the Seeds Act of 1920. The book concludes with 2 appendixes: 1 tabulates the physical data of average samples of crop seeds, i.e. greatest dimensions, weight per 1,000, and per bushel and number per lb.; appendix 2 gives notes and data for practical seed testing of various crop seeds. This book forms the seventh of Messrs. Crosby Lockwood's recent and up-to-date agricultural and horticultural handbooks, others already reviewed in *H.A.* being *Apples of England*, *Pests of fruits and hops*, *Profit from fertilizers*, and *Vegetable crops for market*.

917. GARNER, H. V., HOARE, A. H., LONG, H. C., STAPLEDON, R. G., RAYNS, F., AND WALLACE, T.

631.8 : 631.16

#### ***Profit from fertilizers.***

Crosby Lockwood & Son, 1936, pp. 171, 7s. 6d.

The six authors have produced 8 chapters and 3 appendixes between them. But for the fact that a certain decorum must be preserved in this journal it would have been tempting to quote the chapter headings leaving the diligent reader to assign the authors from the names provided above. The puzzle, however, would have presented no difficulty to the reading agriculturist since the contributors are all closely identified with their respective subjects. Who, for instance, should write about grassland but Professor Stapledon or about the manuring of fruit trees if not Dr. Wallace. The object of the book is not, it is stated, so much to give a detailed account of fertilizers as to indicate that fertilizers are profitable, a fact apparently not yet grasped by a

\* See also 831.

large number of agriculturists. Is it not possible, however, that in most cases the failure to add artificial manures to the land arises not from doubts of their efficacy but from doubts directly connected with bank overdrafts. It is all very well to quote "the faculty of right-spending is at the bottom of all signal success in agriculture", but nowadays if the money is not there it is becoming increasingly difficult to spend it rightly or wrongly. In such cases the first retrenchment is almost certain to be in the fertilizer, the more so since all the effects are gradual, it is hoped they will be negligible and the economy is optimistically presumed to be a temporary one. Chapters 1 and 3 are by H. C. Long and give respectively a brief outline of the elements of plant nutrition and a description of the make up and use of compound and concentrated fertilizers. In chapter 2 H. V. Garner discusses the nutritional requirement of crops and the classes of fertilizers which supply them, compressing a great deal of information into a small space. In chapters 4 and 5 Professor Stapledon writes about meadow and pasture and, as is usual, the atmosphere of Welsh hills and wide open spaces which seems to pervade even the most technical of his writings renders the instructional pill extremely pleasant to swallow. Chapter 6 by F. Rayns is concerned with the manuring of arable crops, which are dealt with individually. In chapter 7 Dr. T. Wallace discusses the manuring of fruit crops, explaining that while it is difficult to forecast with precision what financial returns may be obtained by specific manurial treatments there are certain general principles based on the results of experiments which can be readily applied to particular circumstances. In chapter 8 A. V. Hoare deals first with the general principles of applying fertilizers to commercial vegetables and flowers and subsequently with the requirements of the principal varieties. The book concludes with 3 appendixes by H. V. Garner on the distribution of fertilizers, on the evaluation of manures and on the composition of fertilizers, and finally a short note is given on boron and plant disease.

918. POENICKE, W. 631.541  
*Erfolgreiches Veredeln. (Methods of budding and grafting.)*  
 Gartenbauverlag Trowitzsch & Sohn, Berlin, 1937, pp. 37, R.M. 0.85  
 An illustrated description of well-established methods of grafting and budding.

919. CONFEDERAZIONE FASCISTA DEI LAVORATORI DELL' 'AGRICOLTURA. 63.5  
*Italia rurale (Italian agriculture)*, Rome, 1937, pp. 703.  
 This book gives at a glance statistical information on the agriculture and animal husbandry of all the separate provinces in Italy. Population in 1931, numbers of different domestic animals in 1930 and the areas devoted to the more important crops for the years 1929 to 1936 are all set out. [The atlas published in 1928 by the Istituto Geografico De Agostini of Novara and compiled by Marescalchi and Visintin gives similar information in map form.—ED.]

920. MOLISCH, H. 664.85 : 577.15.04 : 547.313.2  
*Der Einfluss einer Pflanze auf die andere - Allelopathie. (The influence of one plant on another.)* Gustav Fischer, Jena, 1937, pp. viii + 106, R.M. 4.50.

After briefly summarizing the earlier literature dealing with the effect of one plant on another, the author presents his own experimental data dealing with the effect of the vapours given off by ripening apples and other fruits upon the growth of seedlings, epinastic curvatures of leaves, growth of roots, formation of callus, growth of pollen tubes, development of lenticels, leaf-fall, and growth of fungi. One of the most interesting results obtained is the demonstration that these fruit vapours may behave, as regards their effect upon growth phenomena, in much the same way as certain organic poisons. In small doses they stimulate growth, whereas in larger doses they retard it. In still larger doses their effect is definitely injurious. Molisch concludes with a discussion of the possible significance of ethylene in the metabolism of the plant.

C.W.

921. NATTRASS, R. M. 582.8 + 632.4  
***A first list of *Cyprus fungi*.***

Dep. Agric. Cyprus, Nicosia, 1937, pp. 87, bibl. 15, 2s.

This is a careful record of 351 fungi collected in Cyprus during the period 1931-7, and preserved in the herbarium of the Plant Pathologist in the Department of Agriculture, Nicosia. The host plant is given throughout, and the brief descriptions of a number of the fungi are aided by illustrations.

922. HOWARD, A. 631.411.4 + 631.874/5  
***The manufacture of humus from the wastes of the town and the village.***

Headley Brothers, London, 1937, pp. 21.

In this paper humus manufacture from municipal wastes in connexion with hygiene under tropical conditions is discussed.

923. MINISTRY OF AGRICULTURE, LOND. 638.1  
***Bee-keeping.***

*Bull. Minist. Agric., Lond.*, 9, 1937, pp. 56, 1s.

A well illustrated manual for apiarists of which this is the 6th edition. Special attention is paid to problems likely to worry the beginner (including how to escape with "the minimum number of stings").

924. MINISTRY OF AGRICULTURE, LOND. 631.821  
***The use of lime in agriculture.***

*Bull. Minist. Agric., Lond.*, 35, 1937, pp. 25.

The loss of and need for lime in soils is discussed, and a description of the different forms of lime is given, with two methods for their evaluation, a table of their CaO content and price per ton and unit price *ex works*. The final section on the application of lime deals with (1) form of lime to apply, (2) time of application, (3) quantities to apply, (4) duration of the effect, (5) danger of overliming. It is also pointed out that technical advice can be obtained from the County Agricultural Organizer.

925. LÖHNIS, M. P. 546.27 : 581.14  
***Plant development in the absence of boron.***  
*Med. LandbHoogesch. Wageningen*, 1937, deel 41, Verhandeling 3, pp. 37 + 33 fig., bibl. 57.

The author grew many plant species with a view to comparing the stage of growth at which the initial symptoms of boron deficiency may be noted and to discover whether any higher plants exist which can reach full development in the absence of boron. The plants studied included peas, beans, other leguminous plants, the onion and a large number of cereals. The symptoms in each individual case are noted here.

926. IMPERIAL ECONOMIC CTTEE., LOND. 658 : 634.1/8 + 634.85  
***Fruit. A summary of figures of production and trade relating to apples, pears, bananas, citrus fruit, grapes, wine, raisins and currants and canned fruit.***

H.M. Stationery Office, Kingsway, London, W.C.2, 1937, pp. 84, 2s. 6d.

A fruit production and trade review compiled by the Imperial Economic Committee. Notes are given on import duties and trade restrictions in certain European countries. The yearly figures quoted generally refer to the period 1930-6.



927. IMPERIAL ECONOMIC CTTEE., LOND. 664.85 + 664.85.047

**Supplies of canned and dried fruit 1936.**

H.M. Stationery Office, Kingsway, London, W.C.2, 1937, pp. 86, 2s. 6d.

This is a summary of figures of the production of, and trade in, canned fruit and vegetables and dried fruits in the United Kingdom, and is a supplement to *Canned and dried fruit notes* compiled by the same authority.

928. IMPERIAL ECONOMIC CTTEE., LOND. 634.11 + 634.13

**Apples and pears.**

H.M. Stationery Office, Kingsway, London, W.C.2, 1937, pp. 276, 4s. 6d.

A survey of the production of and trade in apples and pears throughout the world. At the present time the international trade in apples is 75% above the average for the post-war quinquennium while the pear trade has about doubled itself in the same period. The credit for this expansion is given to scientific research which has shown producers how to expand production (even though the number of trees in cultivation in the exporting countries has actually been greatly reduced) and to improved methods of transport and storage. The part played by the United States in the production and export of apples and pears is outstanding while the U.K. is pre-eminent as a market, taking up to a third and occasionally a half of the world's exports. Significant trades are being developed by Canada and the Southern Dominions, and Canada, particularly since the introduction of Imperial Preference, is the leading North American apple supplier of the U.K. market. In the years 1934-6 the chief importers of pears into the U.K. were United States, followed by Australia, Belgium and South Africa. The survey opens with a general review of the world trade and then proceeds to deal with each country separately, outlining for each the conditions of production, consumption and trade.

**CONFERENCE.**

929. XIIth INTERNATIONAL HORTICULTURAL CONGRESS.\* 634/5(063)

1. **Summaries of the national reports**, printed for the Secretary-General of the Congress, Berlin NW 40, Schlieffenufer 21, August 1938.

2. **Summaries of the general reports**, pp. 33, ditto.

3. **Summaries of the special reports**, pp. 12, ditto.

1. *Summaries of the national reports*, and 2. *Summaries of the general reports*.

The subjects discussed at this congress were divided into 20 sections. Papers were invited from specialists (national reporters) in every country interested and summaries of these papers were available in handy bulletin form at the congress (see 1 above). These reports were in each case submitted to the examination of one general reporter for each section who was incidentally himself a national reporter. His duty was to summarize the position and to make a report at the congress based on his own and the other national reports. The summaries of these general reporters were also available (see 2 above).

Where at the meetings of the conference it was so arranged that the general reporter was reasonably brief in his discourse and that no time was wasted in repetition of summaries already available, interesting and fruitful discussions arose and certain resolutions were adopted.

The announcement was made that it was hoped to publish the proceedings of the congress including the full reports (presumably both national and general) in about 3 months' time.

Meantime it may interest readers of *Horticultural Abstracts* to note the more important subjects discussed and summarized in the general reports.

\* Kroll Oper., Berlin, August, 1938.

- Section 1. Fruitgrowing. Dr. F. Kobel, Wädenswil, Switzerland. The present state of research work regarding pollination in fruit trees and its practical application.
- Section 2. Vegetable growing. (A) V. E. Truninger, Liebefeld-Bern, Switzerland. The applicability of the results of agricultural research in vegetable growing. (B) M. Górski, Warsaw, Poland. The economics of vegetable manuring.
- Section 3. Flowers and ornamentals. (A) Steffen, Erfurt, Germany. General aims of flower breeding from a market standpoint. (B) B. Ruys, Dedemsvaart, Holland. Perennials. (C) J. J. Beijer, Lisse, Holland. Flower bulbs. (D) R. Chaubert, Orleans, France. Bedding plants. (E) A. Rusconi, San Remo, Italy. Cut flowers. (F) L. de Bruyker, Destelbergen, Belgium. Pot plants.
- Section 4. Horticultural seed growing. C. Göhrn, Odense, Denmark. Horticultural seed growing.
- Section 5. Nurseries. R. G. Hatton, East Malling, England. The present state of research on rootstock plants and the use of rootstock plants.
- Section 6. Tropical and subtropical fruit growing. M. Calvino, San Remo, Italy. The development of fruit growing in the tropics and subtropics and its significance.
- Section 7. Nomenclature. A. Thorsrud, Aas, Norway. Nomenclature.
- Section 8. Plant protection. (A) H. Martin, Long Ashton, England. The application of poisonous plant protective substances. (B) F. Stellwaag, Geisenheim a. Rh., Germany. Experiments on the possibility of substituting non-poisonous for poisonous plant protective substances.
- Section 9. Spice, scent and medicinal plants. (A) H. Flück, Zürich, Switzerland. The influence of natural conditions on medicinal plants. (B) O. Dafert, Vienna, Germany. The influence of cultivation methods on medicinal plants. (C) W. C. de Graaff, Utrecht, Holland. The influence of preparation methods and the standardization of spice, scent and medicinal plants.
- Section 10. Storage. L. Rasmusson, Norrköping, Sweden. Losses in fruit and vegetable storage and their prevention.
- Section 11. Processing and industrial utilization. (A) V. L. S. Charley, Long Ashton, England. Fruit beverages. (B) E. Nehring, Brunswick, Germany. Processing and industrial utilization of fruit and vegetables.
- Section 12. Fruit and vegetables in nutrition and in medicinal science. (A) S. Baglioni, Rome, Italy. Fruit and vegetables in national nutrition. (B) L. Stanley, Washington, U.S.A. Fruit and vegetables in medical science. [Summary not available at time of publication.]
- Section 13. Small plot gardening. Two general reports by Rektor Förster of Germany and I. Ormos of Hungary.
- Section 14. Park and garden planning. Two general reports by Freiherr S. A. Hermelin of Sweden and W. Mertens of Switzerland.
- Section 15. Education. (A) E. Turbat, Orleans, France. Exchange of young gardeners. (B) J. W. G. Ignatius, The Hague, Holland. Training in horticulture and its relation to horticultural development.
- Section 16. Production and market regulation. (A) A. Marozzi, Rome, Italy. Principles and organization of market regulations. (B) P. Gross, Berlin, Germany. The effect of market regulations on horticultural production.
- Section 17. Special questions in plant physiology. M. A. H. Tincker, Wisley, England. The present state of research on growth promoting substances and its applicability to horticulture.



- Section 18. Horticultural technique. G. Mathieu, Avignon, France. Horticultural technique. [Implements, cultivation, additional lighting and warming, etc., greenhouse construction.]
- Section 19. The art of flower arrangement and the flower market. Summaries by F. Kolbrand of Germany and O. Perotti of Italy.
- Section 20. Insurance problems in horticulture. Summaries by C. Manicardi of Italy and Dr. Engel of Germany.

3. *Summaries of the special reports.*

Outside the above sections separate reports were made of the following subjects :—Market regulations in horticulture, J. Boettner, Berlin.—The object and purpose of exhibitions and trials of new varieties in regard to the advancement of horticultural breeding, F. R. Durham, London, England.—Physiological disorders of stored apples in Canada, C. A. Eaves, Kentville, N.S., Canada.—Horticulture as a prerequisite to the development of market gardening, Dr. Ebert Berlin, Germany.—Stimulation of seed breeding and of seed exchange by international agreement, W. J. Franck, Wageningen, Holland.—The importance of locality of production to market gardening, D. Guzzini, Rome, Italy.—The application of the results of research to the growth of young trees, K. Jansz, Warsaw, Poland.—Park and garden planning, J. Jensen, Ellison Bay, Wisc., U.S.A.—The significance of the garden for townspeople, Dr. Knoll, Berlin, Germany.—Flowers and insects, Fr. Knoll, Vienna, Germany.—Biological control of plant disease, B. Trouvelot, Versailles, France.—The significance of fruit and vegetables for national health and vitality, F. Wirz, Munich, Germany.



